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Destruction of the Union Power Plant

The JOURNAL OF ELECTRICITY

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AN ILLUSTRATED REVIEW OF THE INDUSTRIAL APPLICATIONS OF ELECTRICITY, GAS AND POWER.

VOL., II, No. 6 SAN FRANCISCO, JUNE, 1896. { YEARLY SUBSCRIPTION, $1.00 / SINGLE COPIES, - - 10 cents

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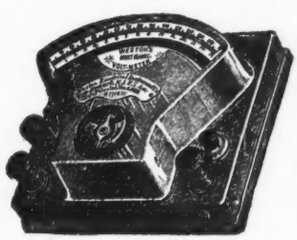

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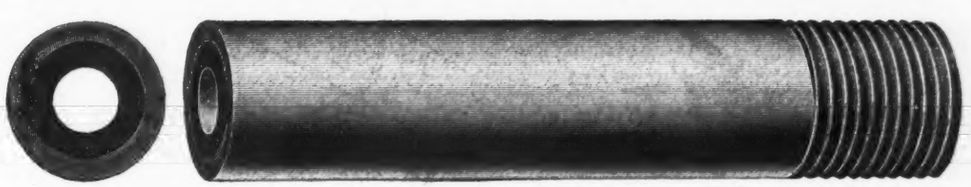

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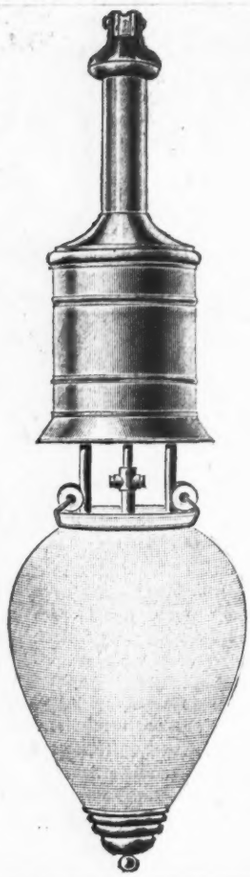

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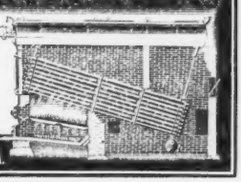

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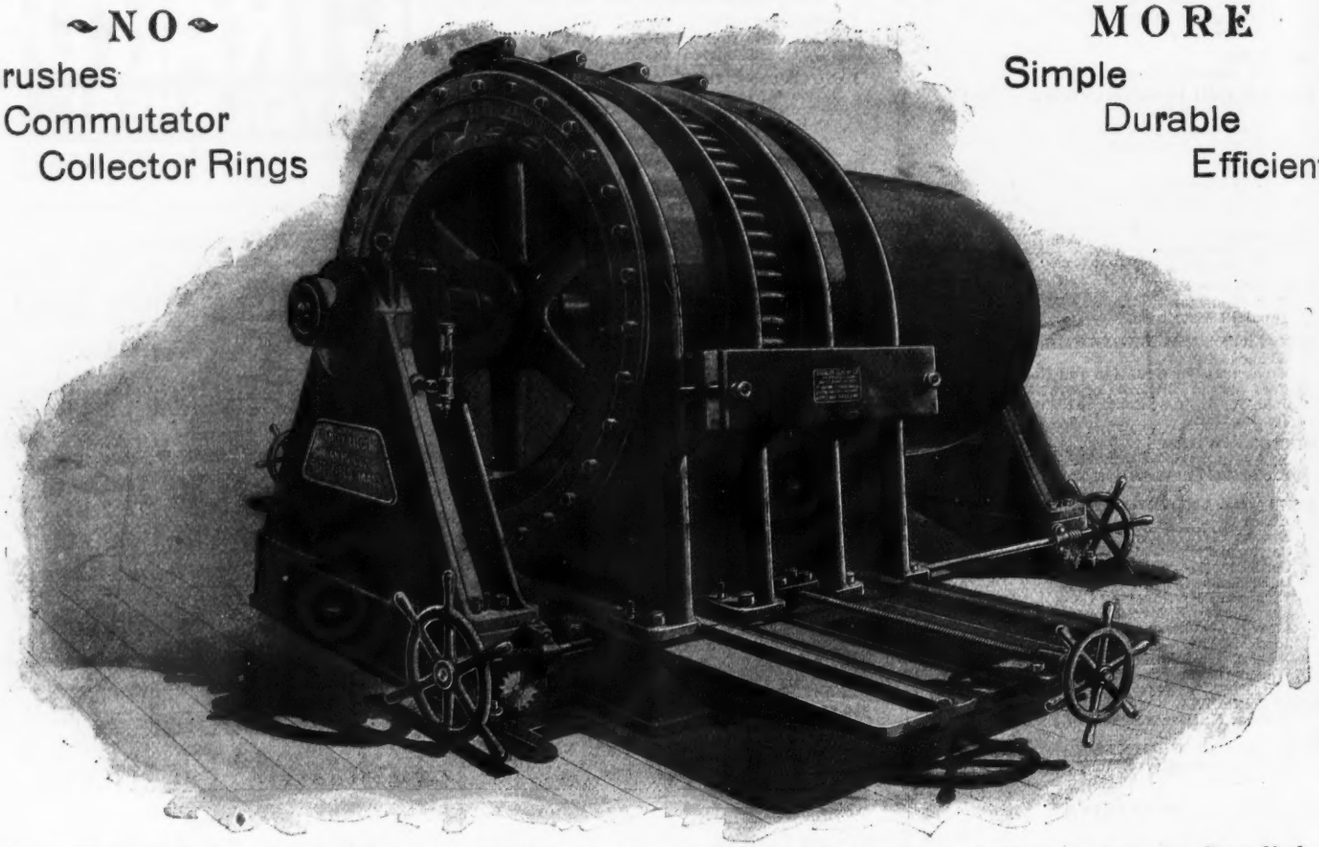

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The Journal of Electricity

VOL. II. JUNE 1896. No. 6

Destruction of the Union Power Plant

The electrical fraternity will regret to learn that the power plant of the Union Power Company, of Portland, Or., which was the first to apply the Edison three-wire system for the transmission of power for the operation of street railways located at considerable distance from the power house, was burned on June 8th, and the completeness of the destructions is clearly shown in the accompanying reproductions of photographs of the ruin. The fire occurred about 4 a. m., shortly before the usual time for the plant to be fired up for the day's run, and from all evidence obtainable it is believed that the fire originated from sparks which found their way from one of the furnaces into the open air through a defective sawdust conveyer, whence it lodged on the frame partition separating the boiler from the engine and generator rooms, probably igniting the fine sawdust flour that had settled on the timbers and developing into flames that quickly enveloped the whole structure. Only the engine and countershafting foundations were of concrete.

FIGURE 1.—A STUDY OF A BURNED RAILWAY GENERATOR

The site of the power house was on low bottom lands at the extreme north end of the City of Portland, and at the time of the fire the June rise of the Columbia River had backed up the water of the Willamette so that this bottom land was covered to a depth of about three feet. The boilers and generators were supported on piling reinforced by wood piers resting on concrete foundations and the fearful wreck formed by the boilers, stacks, breechings and fronts with their sittings and fittings, points to the wisdom of providing suitable foundations capable of supporting the boilers through any fire. The building itself was of substantial frame construction, and the floors being thoroughly oil-soaked, the fire was an extremely hot one. Despite this, however, the 18x18 inch timbers supporting the generators were not sufficiently burned to cause the generators to fall into the water, but their tottering condition rendered it necessary that they should be loaded on barges and docked so that an examination of the machines might be made with safety.

The equipment of the Union Power Company consisted of ten steel boilers, each 60 inches by 16 feet in size, and so connected that they might be operated separately or together. There were two engines, one a Fraser & Chalmers cross compound of 1200 horse power, formerly used for a brief time in one of the Los

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Angeles cable roads, and the other a Buckeye automatic of 500 horse power. Rope transmission was used throughout, and the engines, belted to a countershaft extending the width of the station, transmitted power thence for the operation of seven 150 kilowatt Edison bi-polar railway generators.

The switchboard was equipped with Edison ammeters, Thomson wattmeters, Weston voltmeters and Westinghouse marble base circuit breakers, and its most interesting feature rested in the fact, as stated,

FIGURE 2.—SAWDUST CONVEYOR BETWEEN THE NORTH PACIFIC LUMBER MILLS AND THE UNION POWER PLANT

that it distributed power on the Edison three-wire system. The plant was located probably two miles from a railway center, whence current was fed positive to one system and negative to the other, using the ground for a neutral, and the company, by adopting this distribution, effected a saving of about $11,000 in copper. Sawdust fuel was obtained from the saw mill of the North Pacific Lumber Company, situated about 1500 feet north of the power house, and the sawdust was conveyed from the mill to the plant by means of the long conveyer and dumping carriage shown in Figure 2. Except for the loading of the conveyer cars, which was done by hand, the operation of the conveyer was entirely automatic. The sawdust was dumped into the sawdust house of the plant, now burned, whence it was taken by a smaller boiler conveyer and automatically fed to the boilers. It was owing to a defect in this boiler conveyor, as stated, that the fire originated. The steam plant was equipped with jet condensers operated by two Hall pumps, and was in every way fitted for producing steam power at low cost.

The experience derived in the appraisement of the value of the burned generators developed several interesting points. The dynamos were installed early in the summer of 1892. They are no longer listed for sale as standard apparatus, but can be made by the General Electric Company on special order. Upon their investigations, the appraisers agreed that the depreciation to these machines from advances in the art of dynamo building alone, amounted to ten per cent per annum. The appraisers were unable to find a Pacific Coast market for the wrought iron parts of the generators owing to the fact that the pieces, which weighed from 3,900 to 5,500 pounds each, could not be handled to advantage by any rolling mill on the Pacific Coast. The melting of the zinc bases threw the entire weight of the fields upon the armature shafts, which being heated, caused the shafts to be sprung so seriously as to unfit them for further duty. All of the bed plates were ruined either by cracking or by having been so heated as to cause them to sag. Physically the field circuits were unimpaired, which is undoubtedly due to the fact that the keepers, cores and pole pieces were so massive as to withstand the heat. The manner in which the pulleys were ruined is peculiar in that in each instance the break which occurred appeared to be due to the lightness of the rim which caused it to expand more quickly in the heat than the spokes, and so rapid was its heating and expansion that the rims pulled away from the spokes, leaving cracks that when cold varied from one-thirty-second to thirty-three-seconds of an inch in width entirely around the junction between the spoke and the rim. No information was gathered concerning the permeability of the magnetic field circuit, and opinions vary materially as to the effects which fire will exert on the efficiency of machines. In brief, it was concluded after a thorough examination of all parts of the generators, that it would be impracticable under the circumstances to rebuild them.

Two years ago the Union Power plant was submerged by the unprecedented flood of the Columbia River, and these generators remained under water for two weeks or more. The most approved means were used for drying out the armatures, but with one excep-

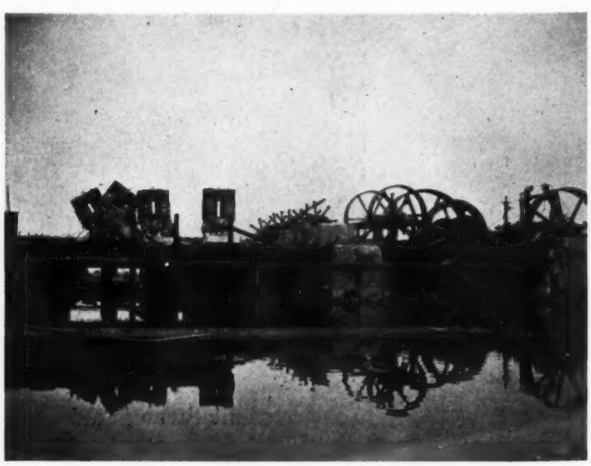

FIGURE 3.—A PARTIAL VIEW OF THE RUINS

tion the armatures burned out after brief runs; the armature which withstood the flood being one that had been rewound and in which the thinnest asbestos paper had been used for insulation.

In January last the plant of the Union Power Company was leased to the Portland General Electric Company, since which time it has been operated in conjunction with the rotary transformers driven by three-

phase power transmitted from Oregon City. Upon the burning of the Union Power plant the reserve steam plant of the Portland General Electric Company at the Inman & Paulson mill has been started up and power has been furnished to the street railway and power circuits of Portland practically without interruption since the fire. The Oregon City circuits and rotary transformers are, however, heavily loaded, but as yet it has not been determined whether the plant of the Union Power Company will be rebuilt, or whether the transmission plant will be enlarged.

FIGURE 4.—THE 100 HORSE POWER ENGINE—AN ILLUSTRATION OF THE VALUE OF GOOD FOUNDATIONS

GENIUS NOT UNAPPRECIATED.

"B," who advertised for a position in the last number of the Journal, will be gratified to know that his qualifications are appreciated, at least in one quarter, as the following letter shows:

SAN FRANCISCO, Cal.

Editor Journal of Electricity.

Sir: Fearing to lose the services of the prodigy mentioned in your last issue under the head of "Don't All Speak at Once," I write this at midnight on receiving your welcome paper. I fully realize that such a man will not long grace the ranks of the unemployed, nor would he accept a low salary, so kindly put me in communication with him at once, as I am afraid to lose his services.

His letter brings to mind a similar one received by the company I represent and we sought for him far and wide, as we desired a first-class cornetist to play solos to our slow speed motors. We have only a small window, but we desire an A1 designer to artistically arrange three or four Cleveland motors, 1887 model, therein. Kindly inquire if he can analyze our motor lubricant as we are afraid it is not correctly mixed. We are also thinking of buying Battery A of the Presidio, and as he is a tip-top battery man his services will be appreciated by us. Kindly inquire also if slow speed motors run any cooler or better if supplied with music from an A flat or a B flat cornet. Perhaps we would be fortunate enough to secure a good baritone, as the company's choir is not yet full.

Taken all in all, such a man would be invaluable to us, and we would not be surprised if he were snapped up by some rival corporation. Don't delay. Answer at once.

PACIFIC MOTOR CO.,
By W. A. HENRY, Manager.

Pneumatics

EFFICIENCIES OF AN AIR TRANSMISSION PLANT.*

BY ALLEN DE WITT FOOTE

Upon the prohibition of placer mining by the State of California, the immense canal systems extending over the Western slopes of the Sierra Nevadas were left without a purpose, and their future existence depended upon a new use for water. Out of this necessity has grown a business of selling water for power and irrigation, retaining the original methods of delivery at the bank of the canal and miners' inch measurement. The price of water is approximately 1 cent per 1000 gallons, delivered at the canal; its cost for power depends upon the pressure that can be obtained from it. In the case of the North Star plant it could have been conveyed directly to the mines and have done its work there on different wheels more or less adapted to the varying conditions; but there is a certain inconvenience and danger in using water in this manner under a high pressure, and, moreover, the mines are on a hill. So it seemed advisable to convey the water directly to the lowest convenient point, obtain the power there and transmit this power to the places where it was needed.

This brought forward the subject of transmission of power, and electricity was naturally suggested first. Visits to mines in operation and careful study and investigation of electrical appliances for underground work, especially pumping, finally decided the author in favor of compressed air. The latter method, under the conditions, was believed to be most economical of power, least liable to accident, and cheapest in first cost. Moreover, almost absolute security against stoppage

FIGURE 4—AMID THE RUINS OF THE UNION POWER PLANT

* Abstract of a paper read before the San Francisco Convention of the American Society of Civil Engineers. (For more complete description of the air compressors, the Cobb Water Wheel and the pumping equipment of the North Star Mining Plant, see the issues of this publication for November 1895 and May 1896.—EDS.)

could be obtained by having a set of boilers on hand ready for firing up in case the water power or air plant gave out, for, by the use of these boilers and opening and shutting a few valves, all the air motors become equally good steam motors; whereas, with electrical transmission an entire set of steam motors would have to be provided to give equal security; or, as the air and steam motors are the same, the electrical motors would require just so much extra expense in cost of plant of equal security against stoppage.

The water supply is obtained from the South Yuba Water Company at a point on their canal about four miles from Grass Valley, in Nevada County, Cal. Thence it is conveyed about two and one-half miles to the Empire Mining Company's works in a 22-inch riveted iron pipe, built more than ten years ago. The new conduit is a riveted steel pipe, 20 inches in diameter, joined to the lower end of this old one under a head of 420 feet, and continues 7070 feet to the power-house, situated at the lowest convenient point on Wolf Creek, just below the town of Grass Valley, where a head of 775 feet, or a static pressure of 335 pounds per square inch, is obtained. The capacity of this pipe is sufficient

FIGURE 6.—A GROUP OF BURNED GENERATORS

to develop 800 to 1000 horse-power. A 6-inch lap-welded pipe conveys the air at 90 pounds pressure from the power-house to the company's Stockbridge shaft on Massachusetts Hill, 800 feet distant and 125 feet higher.

The line of the pipe is quite crooked, both horizontally and vertically and the joint holes cost fully as much as the trench. The latter was about 10 feet wide on top, 45 feet on the bottom and 4 feet deep, and the joint holes were 45 feet long and 3 feet deeper than the trench. The total cost of burying the pipe, including covering a large portion of it with stone, and cement masonry wells for the valves and sustaining the pipe around bends, amounted to $6,756.27. The aqueduct of cement masonry across Wolf Creek contains the pipe and had three arches, the length over all being 153 feet. It cost $1,435, or about $8 per yard. The pipe was made from 48x66-inch sheets, and laid complete in lengths of about 28 feet in the trench under the following schedule, the longitudinal seams being double rivited by hydraulic riveters:

Head in Ft.	Length.	No. B.W G.	Thickness.	Rivets.	Remarks.
420 to 500	2,320 ft.	9	0.148 in.	3/4 in.	cold rivited.
500 to 600	2,110 ft. 6 in.	8	0.165 in.	3/4 in.	"
600 to 700	1,158 ft.	7	0.180 in.	7-16 in.	"
700 to 750	1,204 ft.	6	0.203 in.	1/2 in.	hot rivited.
750 to 775	285 ft.	5	0.220 in.	1/2 in.	"
Receiver.	40 ft.	....	0.375 in.	9-16 in.	"

The specifications required a mild and very tough steel and the cold flat bending test was insisted upon for all thicknesses. The pipe was dipped into the usual hot asphaltum mixture. Where there was no change in direction a slip joint was made by raising the outer end of the link with a small hand derrick, slipping the upper side into the completed portion and catching it there through the rivet holes with bolts. Then by lowering the outer end the weight forced the length into its place with a little care and guidance by chisels, when it was bolted for the riveters. P & B paint was used to cover all points not protected by the original asphaltum mixture because it was considered preferable to the hot mixture when put on the cold metal.

Numerous very small leaks appeared in the pipe under pressure, but neither then nor since then has there been a defective rivet or plate. Fine dust from the wagon road was put into the pipe in considerable quantities, which stopped most of the smaller leaks or sweating. The attempt was made at first to mark the larger leaks and then take off the pressure and calk them as in the case of a steam boiler, but the leak would appear again as soon as the pressure was returned. Since the leaks have been calked under pressure using proper care not to strike heavy blows, all troubles ceased. Close watching was necessary, however, as a stream no larger than a hair, if it happened to be turned along or against the pipe, would, with the aid of the sand it washed in, cut the pipe badly in a few hours. In one instance, two threads of water so small that they failed to wet the earth upward to the surface, shot out at right angles to each other and striking each other formed a miniature whirlpool which bored a hole through the pipe about the size and shape of the point of a lead pencil letting out a larger stream, which soon led to its discovery.

At the lower end of the pipe in the power house is a 20-inch gate, below which is a 12-inch branch leading to the 18-foot Pelton wheel and adjoining this is the receiver two feet in diameter on which are the air chambers, charging tube and release valve. The air chamber is a 10-inch lap-welded tube, 18 feet long standing on the receiver with an 8-inch gate between. The charging tube is similar, but 8 inches diameter. Both have 2-inch water discharge pipes and gates, and by proper manipulation of the gates and the operation of inlet check valve on top of the tubes, the air chamber may be filled. Ordinarily the charging tube is filled up to 90 lbs. pressure from the air compressor delivery

pipe, and then raised by the water pressure. It is found necessary to put in about one-tenth of the volume of the air chamber every day. Where the air goes is thus far a mystery, as no leak has been discovered.

The relief valve was designed by Mr. H. Schussler, Chief Engineer of the Spring Valley Water Works of San Francisco, and is the first of its kind ever made. It seems perfect for the purpose, except that the small pop-valve leaks continually, but it is hoped that this fault may be remedied by using a different form of valve. It can be set to open at about 35 lbs. above normal, and will close without jar or hammer. In action, the pressure rises until it lifts a pop-valve in the ordinary way, when this is raised the pressure is relieved on top of an 8-inch piston, slightly larger at the top end, which rises and opens the ports of a 9-inch outlet. The pressure going down, the pop-valve closes and equalizes the pressure on both ends of the piston, gradually closing it. If the proper pop-valve can be procured, this relief valve will prove a sure safeguard for the pipe. On one occasion already, when from some unknown source a piece of drift wood entered the nozzle and stopped the flow of water instantly this relief valve saved the pipe from serious shock if not actual bursting..

The demand for direct action under a head of 775 feet made a large wheel necessary in order to obtain the proper peripheral speed of half the spouting velocity and the proper speed of 60 to 70 revolutions for the compressors required a wheel of nearly 30 feet in diameter. A wheel 18 feet 6 inches in diameter driving the compressor at 110 r. p. m. was finally built from a design by Mr. E. S. Cobb. Had the design been prepared sooner the wheel could have been made 30 feet in diameter equally as well. The Pelton Water Wheel Co. guaranteed an efficiency of 85 per cent at full load and an average of 75 per cent. from half to full load of the theoretical power of the water and to so govern the wheel that it should not exceed 120 revolutions nor raise the air pressure to above 105 lbs.

The regulator is a floating valve actuated against excessive velocity by the ordinary ball governor and against excessive air pressure by a spring set to move when the air pressure in the delivery pipe exceeds 90 lbs. This floating valve admits water on either end of a hydraulic piston which operates a lever moving a hood up and down over the head of the nozzle as the air pressure becomes too great or the speed gets above or below 110 revolutions. This regulator has now operated the wheel for several weeks and seems almost human in handling its speed. The load can be thrown off entirely and the governor will hold the wheel to 120 revolutions or less and if all the air motors happen to shut down the air pressure will increase rapidly and the wheel will slow down until at 110 lbs. it will stop.

The compressors are arranged to admit of being run at one-quarter, one-half, three-quarters or full load, hence it was quite an object to have a water wheel which would give as nearly as possible the full efficiency under these different loads. For this purpose there are four nozzles, one for each of the heads required, and these are changed with the load. It was of considerable interest to know the efficiency of so large a wheel and as it was necessary to measure the water quite accurately for business purposes a measuring flume 18 ft. long and 6 ft. 9 in. wide was constructed to take the tail water on leaving the building. The overflow was a sharp edged iron about 3 in. high and 15 in. above the bottom of the flume. No contractions were made. An 8-in. pipe about 6 ft. above the overflow connected with the gauge box within which was the measuring scale for the hooked gauge. The apparatus was made as perfect as possible and it is believed that the average result is within 1 per cent. of being correct. The power developed by the wheel was found by taking a large number of indicator cards from the compressor. These were averaged and the friction added, the latter being found by first running one compressor and afterward running it with the other compressor with the valves out; the difference in the quantity of water used was measured and the horse power of this water was called two-thirds of the friction of the machine when loaded, which was equivalent to allowing 50 per cent. for load. The friction of the water wheel and its bearings is included in its efficiency. Repeated tests which check very closely gave the wheel an efficiency of a trifle over 90 per cent. for one-quarter, one-half, three-quarters and full load.

Actual working has shown that this wheel has great efficiency at low speed; it began working using the half load nozzle and gradually, in pumping out the mine as the pumps were lowered and more power was needed, the limit of the machine while running one compressor at 110 to 115 revolutions was reached and the opposite compressor was connected on, the intention being to run three-quarters load with a three-quarters nozzle. As an experiment, both compressors were connected as if for full load and the half load nozzle was retained. The result showed considerable more power with both compressors running at 54 to 65 r. p. m. than was obtained with one compressor at 115 to 120, so much so indeed, that the works were kept running over two weeks longer with the half load nozzle, though the pumps were lowered on an average of 18 inches per day. Of course a large portion of the gain in power can be attributed to the saving in friction and improved working of the compressors under the slow motion, but yet it must be true that the wheel loses very little in its efficiency, compared with the accepted ideas of loss in wheel efficiencies working under a peripheral speed of one-quarter or the spouting velocity.

From the compressors the air is conveyed to the works at the mine, a distance of about 800 feet at a pressure of from 90 to 100 pounds. The transmission pipe is ordinary well tubing, 5¾ inches in diameter inside, screwed together in the trench and bent to fit the

(Continued on Page 134.)

THE JOURNAL OF ELECTRICITY.

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EDITED BY

F. A. C. PERRINE, D. Sc., and GEORGE P. LOW.

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EDITORIAL.

THE NATIONAL SCHOOL IGNOMINY

The Main Office of the National School of Electricity has been taken in charge by the sheriff on account of a confessed judgment amounting to more than $7000, and it is supposed that this must be the opening of the closing chapter in the history of that organization. It will be remembered that during the fall of last year we noticed the establishment of classes belonging to the National School in San Francisco, Sacramento and Los Angeles, and that our comment at the time was mainly favorable to the scheme; though some doubts were expressed concerning the efficiency of the management on account of charges that had been brought against it by well informed electrical papers of the East.

At that time there did not seem to be any reason for expecting this ignominious failure as the school was reported to have a membership of about four thousand which would represent an income of not less than $80,000. As the expenses of the school should have been small, there seems to be no satisfactory explanation of this ending unless the management be directly charged with dishonest practices. Such a conclusion appears to be borne out by the treatment of its instructors and classes on the Pacific Coast, for in no case has an instructor been paid more than the first installment of his salary and no apparatus has been furnished beyond that necessary for illustrating the first half dozen lessons, although the payments of almost all the scholars have been promptly made and forwarded to the home office. The total membership of the classes on the Pacific Coast amounted to more than 125, and we see that the National School of Electricity has deliberately taken from poor young men of the Pacific Coast over $2,500, and, but for the faithfulness of the instructors in charge of the classes, it would have given absolutely no return for this money. As the matter stands the instructors have done the best work in their ability under the circumstances, in spite of the lack of apparatus and no salary payments. This record of dishonesty could only have been made through the aid of the co-operation given in the aims of the school by a number of the best educators in the country, whose names have appeared as members of the honorary faculty, and who cannot be suspected of any cognizance of its dishonest methods. The plan was from the first seen to be a good one, and there was surely no reason for financial failure, had the ordinary principles of business honesty actuated its management.

For the unfortunate scholars and teachers there will probably be found no redress, as the property of the school cannot amount to anything appreciable, though the extensive inauguration of its plan of teaching will undoubtedly be followed by the establishment of many similar classes with a consequent gain to the community, in spite of the hardships the experiment has entailed upon individuals.

WHERE DOES THE TROUBLE LIE?

In the volumes of the Transactions of the American Institute of Electrical Engineers for 1895, we notice but a single article from any member on the Pacific Coast, and this one only amounting to a contributed discussion on the Storage Battery question. Surely more than twenty members covering a distinct section of the United States where are to be found many new electrical problems and new solutions of old problems, should have brought forth more scientific fruit than but a single article published in the Institute transactions. Two years ago there was a strong effort to establish local meetings of the Institute members, and during the winter before last several interesting meetings were held, the attendance at which showed a decided disposition towards increase, but though a local secretary was appointed for the Pacific Coast and one of the vice-presidents now resides in San Francisco, and though the single meeting held during the past winter was one of interest, the efforts for gathering the Institute members together and having the problems of the Pacific Coast presented by local engineers seems to have been altogether lost sight of. We think that we have shown by the articles we have published during the past year that there is ability to present engineering problems from an engineering point of view, and also that the undertakings of the electrical companies on the Pacific Coast cannot be properly presented by far-away engineers who derive their sole information from articles inspired by "Bureaus of Information." The policy of the Institute in the past has not been one to foster the preparation of papers far away from the central meeting place, but with local officers scattered through the country a new disposition on the part of the Institute is apparent, and we believe that strong efforts should be made by local

engineers to show that this change of policy is capable of bringing with it more varied opinions and scientific discussions and scientific papers from new hands.

The Institute membership is not large here, but so far as it goes it stands for good engineering ability, which will obtain greater recognition from the business men of the Coast by any means it can take for strengthening the local organization, and this cannot be done better than by returning to the plan formed two years ago of holding local meetings and endeavoring to bring out at these meetings papers which might ultimately be presented at New York and attract attention to the whole local body.

AIR FOR TRACTION PURPOSES

The New York dailies have been recently filled with articles on the compressed air motor and its availability for traction on surface tram roads, announcements being made that the Metropolitan Traction Company, operating the Broadway, Eighth and Tenth Avenue lines and the Third Avenue Railroad, operating a large cable system, are about to make extensive experiments with these motors and completely equips their lines thereby should the experiments prove a financial success. Both of these lines have within the last four years put down the most complete cable construction that has ever been installed in this country, and it has often been predicted, since they first used the cable, that they would one or both soon abandon it in favor of electric traction, but although the Third Avenue Company spent several hundred thousand dollars in a power plant and experiments with storage battery traction, and though the Metropolitan Traction Company has been operating its Lenox Avenue line on an underground trolley system, the results obtained up to the present have not warranted the introduction of electricity.

This seems hard to understand when we see in many large cities electric lines in successful operation and paying satisfactory dividends; but a comparison of the problem with that in any other city discloses at once certain special conditions that have not been met by electric traction. The streets of New York are not wide, and are much more crowded than those of any other city in the Union, the traffic over these streets requires the cars to be run on the Third Avenue and Broadway lines up to a maximum of eighty per hour, which is not reached in any other system, while the blocks due to drays and wagons are much more frequent than those of other cities. All of these conditions require a special solution of the tram road problem and this solution is not presented by electric traction. In Brooklyn, which is a city where the conditions greatly resemble those of New York, the accidents since the introduction of electric traction have been something appalling. In Chicago, where heavily loaded cable roads exist, an efficiency has been obtained of more than 80 per cent. of the total power of the generating station, applied to hauling cars. This is not approached by any electric railroad system. At the same time the cable does not give enough flexibility to overcome forced stoppages at the time of frequent blockades, and in consequence the management of these roads are searching for a new motive power; not so much for apparatus to increase the financial economy or safety of the system as to obtain a greater flexibility which will allow variable rates of speed and extensions of their lines without, at the same time, sacrificing too much efficiency. It is now believed that they will be able to obtain this by the introduction of compressed air motors.

More than twenty years ago compressed air was used experimentally on some of the New York lines, but at that time the machinery was not well enough developed nor was the problem of rapid transit sufficienty important to warrant its introduction. The engineers who designed the motors of that day have been working upon the problem ever since, and we notice prominently amongst the inventors now installing their motors the name of Hardie, whose system was tried long ago. In Worcester, Mass., compressed air seems to have proved a financial success, and in several cities in France the system has firmly established itself. Now that compressed air has been successful in solving certain long-distance transmission problems to mines on this Coast, we are naturally sanguine concerning the tram road experiments being carried on as we have described in New York.

Electricity has nothing to fear from the success of this means of furnishing motive power and of transmitting power, but we should hail the success of compressed air as another wonderful agent placed in the hands of engineers for the solution of commercial problems.

LORD KELVIN'S ANNIVERSARY

The celebration at Glasgow of the fiftieth anniversary of Lord Kelvin's occupance of a professional chair in that University has attracted the attention of scientific men throughout the world, nor is this to be wondered at when we consider the position of Lord Kelvin amongst practical men and electrical engineers as well as amongst theoretical physicists, and when we consider the advances in the science to which he has devoted the principal part of his attention during the period through which he has occupied the chair. More than all, however, the good will of the whole scientific world goes out to Lord Kelvin at this time on account of the personality of the man. No one who has ever seen this grand scientist has failed to feel the spell of his presence, and to watch his kindly smile. To observe his high scientific enthusiasm is of itself an inspiration to younger men. No one who has ever looked on his face could doubt for a moment that in him laid the power more valuable even than his own power of thinking—the power to make others bold to think. No young man ever came before this most gifted man during his long ser-

vice as a teacher, but went away with something more than lessons alone to remember. It has never been his custom to dampen scientific enthusiasm, but rather to build it up and direct it towards a complete scientific accomplishment.

It is hardly necessary in any part of the world to draw attention in particular to the manifold advances he has made in electricity. To Lord Kelvin we owe the best of our laboratory apparatus used in exact measurement, apparatus which from his first electrometer to his last current balance, shows a power of invention in both scientific and mechanical detail of the very highest order. The submarine telegraphs of the world owe to Lord Kelvin and to Faraday the scientific faith in their possibility which brought with it the faith of business men and enabled their accomplishment. His inventive ability made possible the safe construction of the submarine telegraph lines, and to that same ability we owe their satisfactory manipulation and commercial success. All the time that his work has shown so wonderful a genius as an inventor it has also shown his depth as a thinker and as a mathamatician.

It seems to us that more than all the world, the American electrical engineer should offer his homage to Lord Kelvin at this time, for to his genius we owe the mathematical investigations of the science which has rendered our greatest achievements possible, and through the impetus he has given to mathematical electricity do we owe the type of mind which renders our workers at once mechanics and students of a high order.

Passing Comment

AN EDITORIAL REVIEW OF CURRENT EVENTS AND PUBLICATIONS OF OUR CONTEMPORARIES.

THE HONESTY OF ENGINEERING SCHOOLS.

In the May and June numbers of the "Engineering Magazine" there have been discussion concerning the honesty of engineering schools, taking into account the educational value of their equipments, the alluring statements of their catalogues, the prospects held out by the instructors to new students, and the business connections of engineering teachers. The discussion was begun by Prof. Edgar Kidwell of the Michigan Mining School, at Houghton, Mich., in an article where he condemns not only the methods of our existing schools, but also imputes dishonest intentions to their managements. The article has been replied to by four different instructors, whose letters are printed in the June Magazine, and though exceptions have been taken to Professor Kidwell's manner of statement and to some of his conclusions, the general impression one would gather from the discussion is that there exists at the present time a well founded objection to many of the educational practices of our engineering professors.

We have already called attention to one phase of this discussion in an editorial which was called forth by the announcement that two at least of the professors of electrical engineering had formed business partnerships for the manufacture of machinery. At the time we stated that while an engineering professor could honestly indulge in professional consultation, it was not reasonable for him to expect information concerning the details of apparatus from manufacturers when at the same time he was a competitor of his informants.

The discussion above referred to has confirmed the opinion already expressed, and we deem it a healthy sign that there should be expressed by more than one educator a dissatisfaction with many of our existing methods; we would hardly agree that an engineering professor should be debarred from all business connections since only by being practically involved in works can he obtain the intimate details which concern closely his professional studies. Indeed, in one of the English technical schools, no teacher is admitted who is not doing professional work. It is, of course, a foregone conclusion that this professional work should be but second to his teaching employment, and as we have already stated, only such professional work should be indulged in as will increase his fund of knowledge available for educational purposes.

As regards the other questions of equipment, advertisements and inducements to scholars, we must certainly agree with much that has been said in condemnation of existing methods. It is not possible in a school to educate finished mechanics, and where such representations are made by the catalogue, by the equipment or by the professors, the charge of dishonesty can be sustained. Neither can the finished engineer be graduated from any institution or from any educational course, be it long or short, but the teaching in an engineering school may be easily such as will fit a man to make the best use of his future opportunities, the best use of his ability, and to become, after an apprenticeship of practice, an engineer in the true sense of the word. The school which does this is not necessarily the one making the most promises and publishing the most papers or equipped with the most elaborate machinery, but is one where the underlying principles of engineering education and practice are taught. The attempt to keep an engineering school abreast with the most recent engineering practice as regards machinery is foolish and wasteful of money, since the engineer does not learn methods of measurement or of judgment from the character of machines, but he may form habits of accuracy and care in measurement from required accuracy in the application of testing methods. The work done by advanced students in testing and the publicity given to college tests should not be underestimated, but these things are aside from elementary engineering education, and should not be confused either by the teacher or by the student. Where a man begins such tests he has begun the practice of his profession, and in a sense his engineering education may be considered already completed, for post graduate study is not the work of one or two years at an engineering

school, but should be the work of a lifetime, and whether one or two years of this study are carried on within college walls matters but little; the work is valuable to the student and valuable to the world at large. We are thankful for great equipments which enable it to be pursued to the best advantage, though the engineering school incapable of such work should not be condemned, but rather we must consider that the opportunities offered for undergraduate scholars are not limited by a lack of such equipment.

The quackery, then, does not lie in a great equipment or in great possibilities for deep work, but in the representations that such work is the work of the undergraduate student and not of the man already beginning his engineering career.

ELECTRICAL HEATING IN PRACTICE.

Mr. Fred De Land, writing for the June number of Electrical Engineering, has called attention in his notes of the Electrical Exposition at New York to the electrical heating apparatus there exhibited, and indeed the presence of so many forms of practical electric heating apparatus has apparently settled the dispute of many years concerning the possible usefulness of such a means of heating. There is no doubt but that heating by electricity cannot give the same efficiency, when the total quantities of heat developed are compared, as can be obtained by direct coal heating. Although the efficiency of electric heating apparatus is very high, the consumption of coal is that which is necessary for producing the current required, and when we include all the losses in our reckoning, we find that the total heat cannot be the same as that obtained from the crudest stove; but, on the other hand, the heat available from a stove is not often a large proportion of the total amount of heat developed in the fire, and furthermore the cost may often be a function of the manner in which the heat is furnished, as well as of the amount of heat used.

Let us explain this by a simple example taken from laundry practice. Of the total heat developed by a laundry stove a large proportion is given to the air of the room, by the stove and by the irons themselves after they are put into use, and in consequence the temperature of the room is often oppressive to the operatives, while it is impossible to maintain the irons at a proper temperature for more than a few minutes. As a result, the operators are working at their maximum efficiency for little of the time. Should the iron be too hot, there is danger of destroying the fabrics worked upon, while after the iron has cooled the operator must employ an increased amount of pressure. With an electric iron a given temperature can be maintained indefinitely, and in consequence it is found that the efficiency of the operator using the iron is increased from 35 to 40 per cent, while the temperature of the work-room is materially reduced on account of the absence of the stove. Similarly, glue and pitch pots can be easily maintained at any temperature by this means of heating. For cooking, the great efficiency of the apparatus lies in the possibility of using the current for only such time as the operation of heating is carried on, and for such operations as this electric heating has proved its success, though it is doubtful whether it is possible to install economical electrical apparatus for warming buildings or for any other purpose where a continuous fire may be economically employed.

A NEW ROTARY TRANSFORMER SYSTEM.

One of the most remarkable of recent inventions connected with electrical distribution is the system of alternate current distribution recently developed by Professors Ferraris and Arnot of Turin, Italy, a description of which, translated from L'Electricita, a descripfound in the Electrical Engineer of June 3rd. Reasoning from the action of the various circuits in an induction motor, it was seen that if a two-phase motor should be brought to synchronism and its speed maintained by outside power, one phase of the current might be suppessed, and from the windings previously carrying that phase a current may be taken similar in all respects to the suppressed current; the induction motor thus performing the service of a transformer at once capable of changing the voltage and phase of the primary current in any manner desired. Obviously, if this be done, induction motors may easily be run from any single phase system by the means of such a phase-changing transformer, and this new form of transformer will not only do away with the necessary complications of multiphase wiring systems, but will even admit of alternating current distribution in electric railroad service, remedying such evils as attend direct current railroad working. At the present time we lack the mechanical details of this transformer, but it will at once be seen that the motive power necessary for driving the armature after it has been brought to synchronism is not greater than is necessary in the ordinary form of rotary transformer, while the importance of any system of power transmission from a pair of single phase lines has been well attested by the introduction of the monocyclic system, which assuredly is not more efficient, though more complicated, than the transformer system of Ferraris and Arnot.

Literature.

ANY BOOK PUBLISHED MAILED UPON RECEIPT OF PRICE BY THE JOURNAL OF ELECTRICITY.

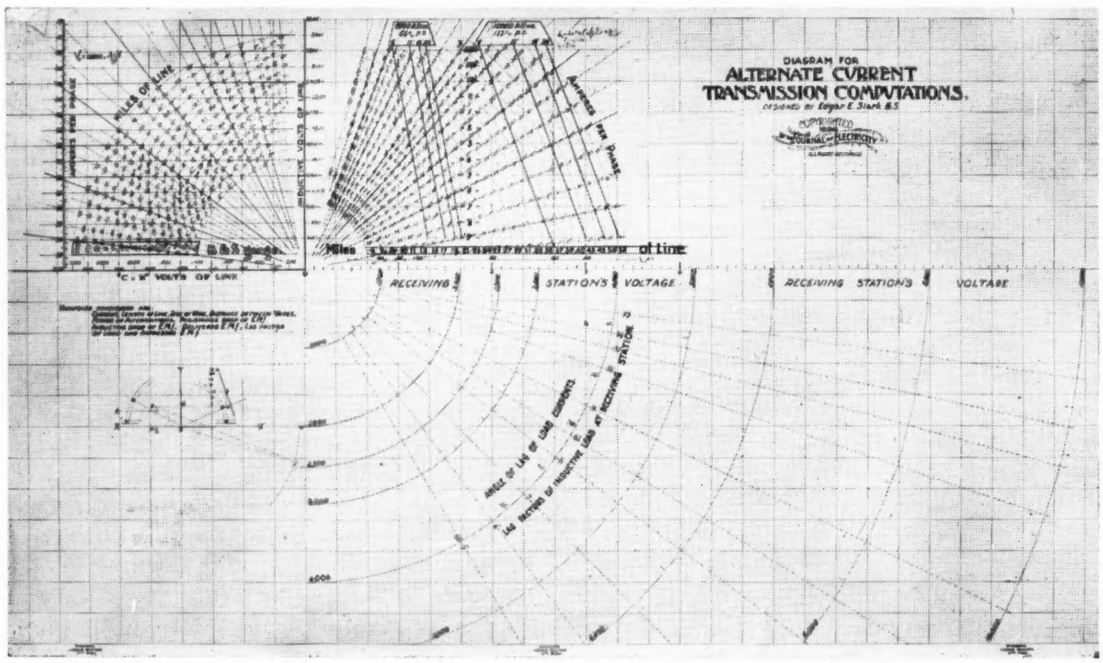
ALTERNATE CURRENT TRANSMISSION COMPUTATIONS. By Edgar E. Stark, B. S. A complete wiring hand book with diagram. In preparation, by the Journal of Electricity, price $1.50.

Of all the literature that has been brought out concerning various modes by which the distribution of electric energy is effected, there is as yet none which fulfills with any approach to satisfaction the exacting requirements of the engineer who, fully cognizant of the importance of the various factors of alternate current transmission, desires at his command a ready and con-

venient means of avoiding the intricate and fatiguing calculations by which the data essential to the construction of transmission lines must at present be derived. Himself an engineer and being of wide experience in the design, construction and installation of transmission plants, none have appreciated more fully than Mr. Stark the amount of time that is lost by reason of these intricate calculations and a full appreciation of the convenience of some means whereby the engineer at a glance could determine the size of wire required to fulfill any given service, led him something more than two years ago to a series of investigations upon which the diagram herewith briefly outlined is based. Since that time the author has been almost constantly at work upon the subject and the results of his labors are shown in the work soon to be presented.

A synopsis of the work is best given in the statement that it embodies both in an elementary and a theoretical way a full consideration of each and every factor entering into the problem of transmission by alternating or polyphase currents, and in presenting this subject the author has thoroughly grasped the idea that no branch of electrical engineering offers a wider scope for original research, or is so little understood, or embodies features concerning which the electrical public at large desires more clear and lucid explanation than that of the calculations of alternating circuits. It is evident from Mr. Stark's work that his endeavor is that every reader of his book shall have a clear understanding of the points involved, whether the reader be a lineman, a station attendant or an engineer, or in brief, whether he be of rudimental or of the highest education. It follows therefore, that there are portions of the work which in the mind of the theoretical student might have been omitted to advantage, and conversely, it will also seem to many that little has been gained by bringing out in full the theoretical deductions upon which the diagram has been constructed. To have omitted any portion, however, would have seriously detracted from the value of the book as a complete exposition of all that pertains to the practical consideration of transmission lines carrying alternating or polyphase currents.

The general outlines of the diagram will be evident in the accompanying illustration. In itself the chart considers the ten chief variables in transmission computation, namely; current, length of line, size of wire, distance between wires, period of alternations, resistance drop of electro-motive force, inductive drop of electro-motive force, delivered electro-motive force, lag factor of load, and the impresed electro-motive force. The range of the diagram is from 0 to 10,000 volts at the receiving station, while from the scale the ohmic and inductive volts considered each range from 0 to 3,200 volts. The length of the transmission line runs from 6 to 55 miles. Its periodicities vary from 33 to 165, while the amperes run as high as 160 per phase. Moreover the lag factors of inductive load at the receiving station vary from 50 per cent. to 99 per cent., which fully includes all translating devices that may be in use. The diagram is so laid out as to enable the derivation of factors for transmissions of any distance or voltage from which may be readily derived the required data for that distance or voltage.



"ALTERNATE CURRENT TRANSMISSION COMPUTATIONS," BY E. E. STARK.

Mr. Stark's work will, in brief, satisfy every requirement and the layman in transmission computations who does not comprehend the meaning of the term "lag factor" for instance need not be dismayed because of its use, owing to the full explanations and accompanying diagrams which have been given.

STEAM, ITS GENERATION AND USE. Babcock & Wilcox Company. Twenty-ninth edition. Printed for free distribution. 182 pp. New York and London. January, 1896.

We have received with pleasure a new edition of the valuable handbook on Steam and Its Generation, published by the Babcock & Wilcox Boiler Company. No extensions have been made in the matter relating to boilers and boiler tests printed in the previous editions, and which is already so familiar to engineers, but the book has been extended by twenty-two pages of cuts,

illustrating new boiler plants throughout the world and the system of steel forgings required in the construction of the boilers for withstanding high pressures of steam. These features being mainly photographs tell their own story and illustrate very clearly this advance in steam boiler construction, as well as the latest designs of steam generating plants, where we notice particularly a tendency to follow the lead of the Edison Company in placing the boilers and coal storage above the level of the engine-room floor. That this should be not only possible, but a growing, tendency, disposes at once of the question of wet steam from such boilers for this construction would not be possible were priming likely to occur. The use of steel in these boilers has required some remarkable shapes in sheet metal forging, and the possibility of such shapes in malleable steel places in the hands of engineers a means of boiler and steam-pipe construction far more reliable than has heretofore been possible with cast-iron parts.

RUHMKORFF INDUCTION COILS. By H. S. Norrie. New York. Spon & Chamberlain. Paper. 180 pp. Price 50 cents.

The interest that has been awakened by the Roentgen experiments in high potential induction phenomena have called forth this little handbook on the practical "construction, operation and application" of Ruhmkorff induction coils to which has been added some chapters on the manufacture of the Tesla coil with the Thomson air gap source of alternating electromotive force.

While belonging to a class of timely books (having been composed of chapters collected from the author's writings in periodical literature), the book does not show evidences of hasty construction or of unscientific methods, but is mainly striking for the fact that in it are embodied the most correct principles in the design of induction apparatus; indeed, we do not remember having seen a handbook of induction coil construction in which a writer avoids so thoroughly "rule of thumb" methods as is shown in this work. The coils described are not simply those for the production of a slight physical shock, but also the methods of manufacturing very high potential coils are here very clearly laid out, together with the most recent methods of constructing contact breakers and condensers.

The application of the coil to Geissler tube phenomena has been carried beyond the stage of "play" science into spectrum analysis and Roentgen tube manipulation. Here for the first time a practical Tesla induction coil is described, and the proportions determined from experience, explained so completely that they may be followed by any one capable of attempting this class of experimentation. That the author should be able to lay down in a few pages such clear and satisfactory rules for the construction of this apparatus leads to a feeling of disappointment that he has not undertaken a more careful study of the theory underlying the action of the apparatus itself, for while such an amount of theoretical discussions as would be necessary might unduly increase the bulk and cost of this manual, it is nevertheless true that even amateur experimentalists are more and more breaking away from the idea of "play" science, and endeavoring to understand more clearly the principles of the action of scientific instruments whose phenomena they are enjoying.

In the chapter on condensers we notice no hint of the manufacture of condensers with built up or composite mica sheets, nor those made with varnish insulation, which have recently been brought to so high a state of perfection, and similarly throughout the book the criticism might be made of too many subjects treated less than completely. Elementary instructions on primary and secondary batteries are out of place in such a work at the present time, while more extensive descriptions of spectrum analysis and gas decomposition might profitably have been added.

As an elementary handbook the book is to be commended on the principle that the instruction contained is very explicit and in no sense misleading.

WILLIAM GILBERT, OF COLCHESTER, on the Loadstone and Magnetic Bodies. Translated by P. Fleury Mottelay. New York, John Wiley & Sons, 1893. 358 pp. Price $4.

Inductive science surely owes as much to William Gilbert, of Colchester, as to his contemporary, Lord Bacon, for Gilbert employed the method without the theory, while Bacon explained the theory of the method without its application. Accordingly Gilbert's treatise has been looked upon by electricians as the foundation work in their science, and the methods employed by this physician of Queen Elizabeth's court cannot be too carefully studied by those of us at the present time who are prone to prefer theorizing upon the discoveries of others rather than attempting such discoveries on their own account.

A study of this book will show not only that Gilbert was capable of making careful experiments and of seeing the truths of nature as taught by his experiments, but it will show how far an experimental mind might wander afield in metaphysical speculations on leaving the experimental laboratory.

Before Gilbert's time the compass was used, and its properties mainly understood, though the principle of the loadstone and of the magnet where too completely confused in the metaphysical speculations of schoolmen, who had observed their more manifest phenomena for their true interconnection and their relation to the earth's magnetic field, to be clearly understood. From a mass of theories and speculations Gilbert rescued the science by carefully testing the properties of definite magnets and of magnetic or non-magnetic materials; indeed, the distinction between these substances was first clearly understood by Gilbert, and no one before his time had offered any proof of the manner of production or destruction of magnets.

The old idea that the compass would be falsified by the application of garlic, that it had an attraction for the diamond, that it might be made to point East and West, were forever laid aside by Gilbert's experiments. He first drew the "field of force" about a magnet and inaugurated the system of plotting such a field by the aid of a small steel magnetic needle which we use today. The earth as a great magnet was scientifically deduced by Gilbert from his experiments upon little magnetic globes about which he had traced the magnetic field and proved the existence of magnetic meridians. That an iron bar could be magnetized in the earth's field without contact with magnetic bodies was Gilbert's discovery.

When we consider the importance of such a firm ground work laid for scientific experimentation we cannot fail to admit the skill and power of careful observation shown by this old doctor, especially when we realize that his life was spent entirely among those with whom theories and not facts were considered to be vital. Nor, when we consider his surroundings, must we wonder that many pages were added in the construction of theories which led him far from his

laboratory and which to-day are relegated to the "limbo" of the curious past, whose imaginings may have raised pleasant possibilities, but which throw little light for the modern scientist upon his present conclusions.

The translation by M. Mottelay has been a labor of love, for which we must render thanks that we have this master done into good, simple English, and it would be small credit to us to join with those who have found fault with his enterprise on account of the fact that it was completed before the society of Gilbert's compatriots had fairly completed their plans for a similar work.

EFFICIENCIES OF AN AIR TRANSMISSION PLANT.

(Continued from Page 127.)

uneven ground by building fires around it and heating it until its own weight shaped it to the surface. It was tested under a hydrostatic pressure of 120 pounds. No leakage was discovered and none has appeared since. As yet only half of the full load of air has been passed through the pipe so no data of value regarding loss in transmission have been obtained. With the present load a difference in pressure between the power house and the mine is not sufficient to be detected. At the mine there is an ordinary air receiver and three 50 h. p. boilers set ready for steam, which are used for receivers.

From the receivers the air is taken into heaters also designed by Mr. Rix, and at present it requires a little over half a cord of good pine wood each 24 hours to heat about 700 cubic feet of free air per minute to 350 to 400 degrees Fahr. The heated air passes through covered pipes to the first cylinder of the hoisting engine from which it is exhausted back into the upper heater where its temperature is again brought to 350 degrees, whence it passes into the second cylinder at 30 pounds pressure. From this it is exhausted through a flue to the change house where it is used for heating and drying clothes. For the first heater also the air for the pump is conveyed some 300 feet down in the shaft in a covered pipe. The pump receives air at about 275 degrees and exhausts it into the shaft at about 60 degrees, giving plenty of cool pure air to the men without fans or ventilators. At present the pump is throwing 600 gallons per minute 240 feet high. In addition, there is a direct acting donkey pump throwing 350 gallons 110 feet high in another shaft 750 feet distant, to which the air is carried cold in a 2-inch pipe over the surface. An old hot water heater is used as a reheater consuming 12 sticks of pine cord wood per 24 hours. The hoisting engine, also designed by Mr. Rix, is a compound direct acting Corliss of 100 h. p. with cylinders jacketed for hot air and calculated to work 3,000 feet down an incline of 35 degrees; while specially adapted to the use of heated air, it takes steam equally well.

Efficiencies often seem to depend largely on the personal equation of the reporter. Mr. Rix spent a number of weeks in making his summary of tests and while agreeing with him in the main the following are submitted as the author's conclusions. In any case the fact is that there is 304 theoretical horse power in the water used at the power house, the work actually accomplished at the mine amounts to 203 horse power, and the cost of reheating is $3 per day.

Efficiency of compression and transmission from water wheel to motors, and not including cost of reheating..... 79.5%
Efficiency of compression and transmission from theoretical power of the water to the motors, and not including cost of reheating..... 74 %
Efficiency from the water wheel to and through the motors, not including reheating..... 71.6%
Efficiency from the theoretical power of the water, to and through the motors, and not including the cost of reheating..... 66 %
Efficiency of compression and transmission from water wheel to motors, including the cost of reheating expressed in water power. 73 %
Efficiency of compression and transmission from the theoretical power of the water to the motors, including the cost of reheating expressed in water-power..... 68.4%
Efficiency of compression and transmission from the water wheel to and through motors, including cost of reheating expressed in water-power..... 65.5%
Efficiency of compression and transmission from the theoretical power of water to and through the motors, including cost of reheating expressed in water-power..... 61.6%

Horse-power of air at works after reheating: 225.32.
Horse-power delivered to compressors by water wheel: 283.
Theoretical horse-power of water used on the wheel: 304.
Horse-power of work actually done by the motors: 202.7.
The horse-power delivered by the water wheel to the compressor, to which is added the horse-power (24.66) which the cost of the wood used in reheating would buy in water: $307.66 = 283 \times 24.66$.
The theoretical horse-power of the water used on the wheel added to the horse-power (24.66) which the cost of the wood used in reheating would buy in water: $329 = 304 \times 24.66$.

It may be urged that the conditions are particularly favorable to compressed air, as the transmission is short and the power is not needed for tramways or lighting. For lighting it is admitted without question, and possibly for tramways, that electricity is preferable, but for transmission, were it 20 miles instead of 1,000 feet, it is thought by the author that, taking the whole plant, compressor, transmission pipe and motor, as against generator, transmission wires, transformers and electric motors, the air will prove cheaper in first cost, higher in efficiency, less liable to accident, and less expensive to operate and maintain.

Gas

GAS ENGINE POSSIBILITIES.

While the gas engine has been known and used for many years in a small way, and with remarkably good results as far as economy goes, it is only since a short time that its merits have been fully appreciated. It is now, with the introduction of new methods of gas production, by the use of by-product-saving appliances that go far toward paying the original cost of fuel, and thus reducing the cost of the fuel gas to a very low figure, doing much to solve the problem of cheap and effective power.

As these gases are low in illuminating qualities, they are very much better suited to give the highest efficiency in the gas engine. Another gas that has recently been discovered has remarkable qualities under compression, and can be reduced in volume 400 times at 800 pounds, and when expanded will burn with twenty times its volume of air, requiring only 0.4 of a pound of it when compressed to develop one-horse power per hour. Each cubic foot of it at this pressure weighs thirty pounds, and, therefore, contains seventy-five horse-power hours, being the greatest storage of energy ever known for a given weight.

This opens a wonderful field for the development of power for motors for tram cars and other classes of motor vehicles, as well as pleasure boats. Gas engines, working with this new fuel gas, are likely to have a very large use in all stationary work, and for propelling boats, and it may not be beyond the bounds of possibility to drive ocean steamers and locomotives of the future by gas engines. It is especially suited to the generation of electricity, particularly when the electric plant is located at inaccessible points where it cannot be

reached by boat or rail, and where coal would have to be carted and from which ashes would have to be removed.—George S. Strong, in Cassier's Magazine.

PACIFIC COAST GAS ASSOCIATION.

The fourth annual meeting of the Pacific Coast Gas Association held in San Francisco on July 21st to 23rd, inclusive, proved to be one of the most interesting and instructive conventions of that organization. The following members of the Association were present:

H. E. Adams of Stockton, Charles Adams of Portland, C. R. Allen of San Francisco, C. E. Burrows of Walla Walla, Washington; J. A. Britton of Oakland, A. Corrigan of San Francisco, D. J. Collins of Philadelphia, J. B. Crockett of San Francisco, C. M. Converse, of San Francisco, John Clements of Red Bluff, Frank A. Cressy of Modesto, S. B. Cushing of San Rafael, James McNeil of Santa Cruz, M. C. Osborne of Santa Cruz, T. R. Parker of Napa, Thomas D. Petck of Eureka, R. M. Powers of San Diego, B. U. Steinman of Sacramento, E. F. Sherman of Portland, L. P. St. Clair of Bakersfield, G. H. Taylor of Chico, George Thompson of Woodland, A. J. Vanderwhite of San Francisco, J. P. Grimwood of San Francisco, John L. Howard of San Francisco, E. C. Jones of San Francisco, J. C. Kaneen of San Rafael, D. E. night of Marysville, B. A. Knight of San Francisco, George Keaton of Gilroy, H. T. Lally of San Francisco, H. J. Lewelling of St. Helena, C. O. G. Miller of San Francisco, P. Meyer of Livermore, W. B. Cline of Los Angeles, W. M. Duval, W. Dunbar, F. H. Eichbaum, Richard Fenner, C. F. Fogg, C. Troelich of San Francisco, H. P. Goodman of Napa, R. P. Greer, O. M. Gregory, W. W. Gillespie of San Jose, W. S. Wharton of Fairhaven, Washington, G. W. Wilson of Vallejo.

The following officers were elected to serve during the ensuing year:

T. R. Parker of Napa, President; F. H. Eichbaum of San Francisco, Vice-President; John A. Britton of Oakladn, Secretary and Treasurer; L. P. St. Clair of Bakersfield, M. C. Osborne of Santa Cruz, J. Clement of Red Bluff and R. M. Powers of San Diego, Directors.

President E. C. Jones delivered an address of welcome, during which he said: "The future of the gas business looks bright in the promise of prosperity; we are not wedded to any kind of gas, or any method of producing it, and by our untiring efforts to extend our business by introducing new gas consuming devices and cheapening the cost of prduction, by the adoption of the latest improvements we shall mold the future of the gas business. The future of our business lies in the hands of the gas engineer; he is its custodian, and on his studious thought and earnest work depends the measure of its brightness."

As will be seen from the following list of papers presented the topics discussed presented a wide range of subjects, but owing to a resolution of the Association to the effect that the papers presented or the discussions brought out may only be published through the official organ—The American Gas Light Journal of New York—out of respect to the Association it is impossible to publish any portion of its transactions. The papers discussed were as follows:

(1.) "The Economical Uses of Coal," John L. Howard, San Francisco; (2) "The Relative Position of Consolidated Gas and Electric Light Plants," M. C. Osborn, Santa Cruz; (3) "Oil Tar and Its Uses," J. B. Grimwood, San Francisco; (4) "Telescoping a Single Lift Gas Holder While in Use," J. L. Fogg, San Francisco; (5) "Gas Stoves," D. Decker, Fresno; (6) "Evolution of the Gas Meter," Chas. H. Dickey, Baltimore, Md.; (7) Municipal Ownership," John A. Britton, Oakland; (8) "Water Gas," Chas. F. Adams, Portland, Or.; (9) "Wrinkles," T. R. Parker, Napa; (10) "Experiences," John Clements, Red Bluff.

During the proceedings exhibitions were made of acetylene gas and the mode of shadowgraphing by means of Roentgen rays. The last day of the meeting was devoted to a delightful excursion and luncheon on Mt. Tamalpais as the guests of Mr. S. B. Cushing, President of the Mt. Tamalpais Scenic Railway Co.

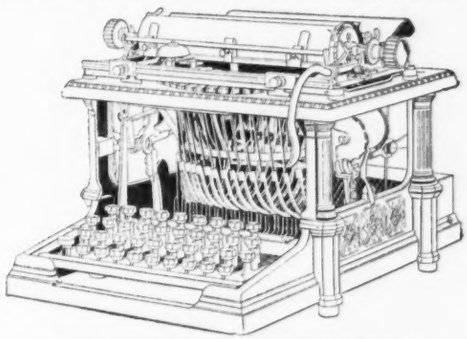
The Trade.

In Responding to Advertisements in this Publication, please mention "The Journal of Electricity."

A NEW TYPEWRITER.

The Howe Scale Company, with office and salesroom at Nos. 12 and 14 Pine street, San Francisco, Calif., are the Pacific Coast representatives of the Remington-Sholes Typewriter, a new machine in this field, but its manifest advantages over the older makes of writing machines will at once place it in the front rank here as elsewhere.

Twenty or more years ago, a combination of the elder Sholes and the Remingtons brought out what is now known as the Remington Standard Typewriter, which has in name and in fact been the Standard writing machine of the world. The first generation did its work well, and to them all credit is due, but it has remained for the sons of these pioneers in the typewriter field to bring out a writing machine in which are incorporated the most valuable features of the various makes of typewriters now on the market, together with many new improvements, which make the Remington-Sholes the typewriter par excellence.



THE REMINGTON-SHOLES TYPEWRITER

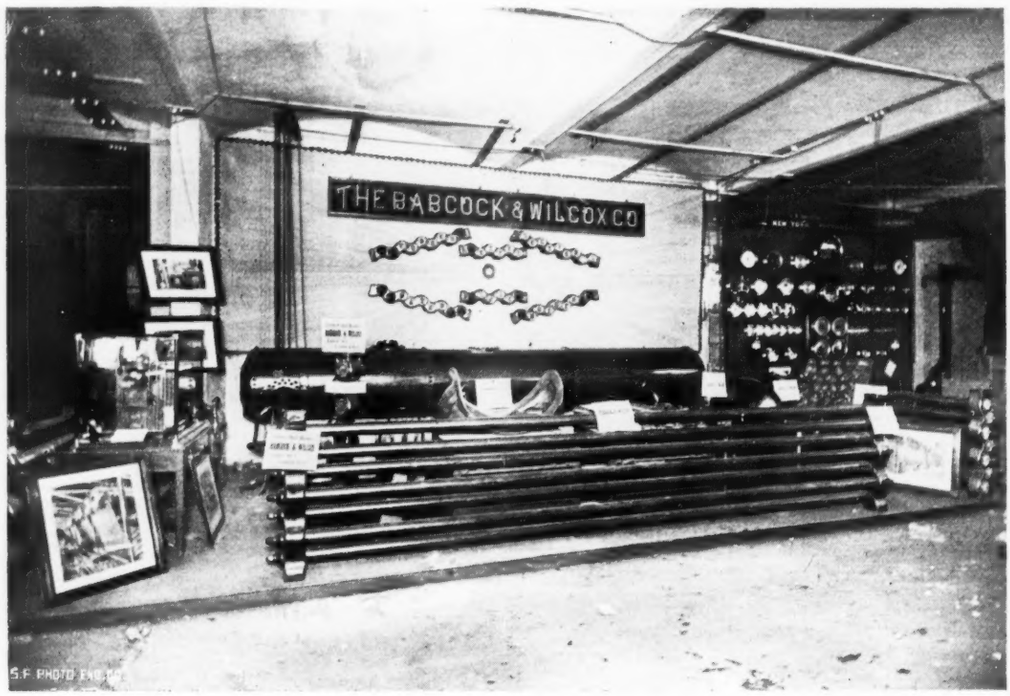
Among the many new and original ideas that have been embodied in this modern machine, may be mentioned the absolutely rigid carriage, in connection with the Universal Keyboard, such as is used on all Standard shift-key machines. It is the only machine on the market in which the ordinary nine-inch carriage can be instantly changed for the twelve-inch carriage, thereby serving the purpose of two machines. These carriages are made very strong and extremely simple, having some forty less parts than any standard machine, and to see the work, simply the cylinder alone is turned up high enough to allow of easy erasure.

This machine has been constructed with the view of enabling the operator to do his own repairing. All parts are made interchangeable and can be removed im-

mediately by any operator of ordinary intelligence.

In point of finish it is by far the handsomest machine of any we have yet seen, being finished in what is known as the Bower-Barff process, and presents an appearance unsurpassed for quiet elegance and artistic effect.

The fact that Mr. Allan Mc. D. Riddell, formerly manager of the Pacific Coast Agency of Wyckoff, Seamans & Benedict, manufacturers of the well-known Standard Typewriter, and Mr. J. V. Sweetser, late sales agent of the same concern, have resigned their position to accept a similar situation in behalf of the Remington-Sholes Typewriter, are straws demonstrating that the Remington-Sholes Typewriter machine is superior to every other hertofore offered. It may be added that the new Typewriter has been adopted by the Journal of Electricity after a thorough examination of practically every other typewriter in use.



RECENT IMPROVEMENTS IN STEAM BOILERS.

The exhibit of the Babcock & Wilcox Company, makers of forged steel sectional high pressure boilers at the National Electrical Exposition recently held in New York, is situated on the ground floor and covers a space of 500 square feet. The space is admirably situated for the display of the parts which go to make up their well known steam boilers. They exhibit the various parts of their sectional water tube boilers, arranged in such a manner that the visitor is afforded every opportunity for the most critical examination of each individual part. The lighting of the exhibit is a feature that has drawn pleasing comment from many of the Electrical Convention delegates. To the investigator interested in the economical production of steam under high pressures, this exhibit will repay the time spent in a visit.

A 36-inch steam and water drum is arranged on rolls, which enables the attendant to so revolve the drum as to bring into view every portion of its construction in order that the visitor may more minutely examine the design and workmanship. The cylindrical portion of the drum is made of three sheets of open hearth steel. The longitudinal seams are butt-strapped inside and out. All holes are punched 5-16 inch smaller than the diameter of the rivets to be used, through steel templates, and drilled out the full size after the sheets are rolled and assembled with the butt-straps in position. After drilling, the straps are removed, all burrs cleaned off and the plates re-assembled, metal to metal, with parallel turned bolts fitting the holes before riveting. Each course is then built independently to template. The various courses and their heads are assembled by an hydraulic forging press at a pressure of 12 tons. All rivets are driven with a 60-ton pressure and held until cold. The drumheads are fitted with manholes. These heads are forged at a single heat with the extra manhole rings and stiffening plate in position, and have flat raised seats for stand pipe and feed connections. The edges of the head and manhole faces are machined off true. The manhole fittings are of forged steel. The plate is machined and turned to a true oval to fit the head. The steam flanges are of forged steel, recessed to make a male and female joint, fitted with stud bolts, tapered threads and inside keeper nuts. This standard steam and water drum is tested in the shops and again when erected on the purchaser's premises to 300 pounds hydrostatic pressure.

The crossboxes into which are expanded the water circulating uptakes are forged from a single sheet of open hearth steel without seams or rivets.

The three sections shown, and used as a fence around the exhibit, are built up of 4-inch tubes, expanded into forged steel headers. These tubes are made of the best knobbled and hammered charcoal iron blooms of standard weight and of such quality that a 1500-pound hammer dropped five feet onto a tube shall crush the tube without showing cracks or flaws. These sections are subjected to an hydrostatic pressure of 400 pounds after assembling.

The header shown standing upon end is forged from a single sheet of openhearth steel, serpentine in form, disposing the tubes in a staggered position when assem-

bled in the furnace. The method of expanding the tubes is shown, as also the cap, clamps and handhole fittings.

The handholes are of sufficient size to permit the cleaning, removal and renewal of a tube, the handholes being placed opposite the tube ends. The handholes have a raised seat milled off to a true surface and covered on the outside with a forged steel cap (also milled to a true surface) and held in position by a forged steel safety clamp, closing the handhole opening on the inside and secured by a bullhead bolt to secure correct alignment, and a forged cap nut. This method of closing handholes is a perfect one mechanically, insuring a tight joint, metal to metal, without packing of any kind.

They show a line of high pressure brass steam boiler fittings designed for any pressure demanded. These fittings are the design of the Company and are the product of their many years of designing and constructing high pressure plants. These fittings are now in use on boilers working at 350 pounds pressure.

Photographs of many of the large plants installed by the Company are shown, and also photographs of their Chain-Grate Automatic Stoker.

They show also a model of their standard high-pressure sectional boiler. It is perfect in every detail, and is capable of generating steam. The boilers built by this Company of the forged steel type are the only sectional boilers made of forged metal—all others using cast iron or steel. They are designed throughout to carry safely a working pressure of 200 pounds per square inch.

As is well known, Mr. Stephen Wilcox was the inventor of the inclined tube type of water boilers—the type now almost universally used. The Babcock & Wilcox Company have on exhibit there Mr. Wilcox's original model of his invention made in 1856. This model is historical, though the bent tubes shown were discarded very soon for the straight tubes now used, and the boiler was changed step by step into its present sectional form nearly thirty years ago. Then came the substitution of forgings for castings until the present type was developed. The forgings shown, particularly the serpentine header, are the most difficult and intricate ever attempted and represent the most advanced work yet done in steel forging.

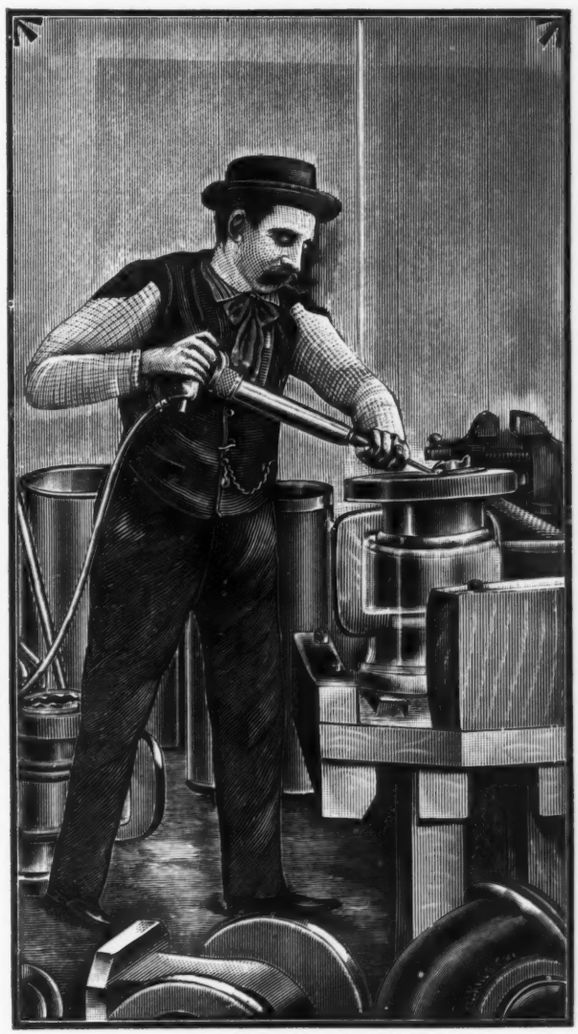
PNEUMATIC SHOP TOOLS.

During the past week there has been an exhibition at the show rooms of the Rix Compressed Air Machinery Company, some of the Pneumatic Tools manufactured by the Chicago Pneumatic Tool Company, which has placed its agency with the above San Francisco firm. Five or six different sizes of these tools were in operation, carving marble, chipping castings, cutting granite, driving rivets and calking boiler seams. The tools seem to be admirably adapted to the work and are quite marvelous in the rapidity and accuracy of their operation. In carving marble the material appears to melt away in front of the tool, without effort, and with the smaller sized tools, running at medium speed, the blow is so light and delicate that it cannot be imitated in any hand tool.

These pneumatic tools are light and easy to handle and are under the perfect control of the person manipulating them. Various tools of any size can be instantly placed in the hammer, and there is no delay in making changes. In doing iron work, such as chipping castings or in calking boilers, they do the work of about three or four men, and do it, of course, much more perfectly.

They are distinctly a labor-saving device, and besides the uses above mentioned, they can be used for driving nails, wood drift pins in ship building, chipping castings, cutting boiler plate, cutting out flues, fire box patches, stay bolts and rivets. In beading locomotive flues the Company guarantees that their tools will bead 2½ flues per minute and much more perfectly than can be done by hand.

For carving the ornamental work on the faces of stone buildings, these tools prove money-makers for the contractors. A small air compressor, driven by a gasoline engine, could be placed upon an ordinary truck, and air in a small hose could be carried to the tools, which could be operated upon the face of the building. Contractors find them greatly to their advantage for carving the fronts of Eastern buildings, both in the saving of money and in the saving of time. In California sand stones, which are comparatively soft and easily worked, the tool should prove quite an advantage to stone cutters. New uses are constantly being discovered for this little tool, and there seems scarcely any limit to its usefulness about manufacturing work of any kind.



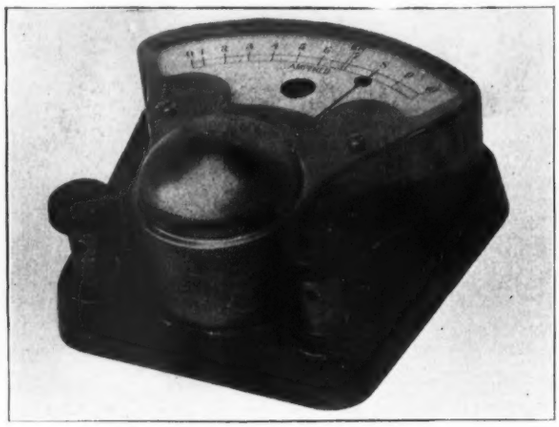
There will be an exhibition given in the Mechanics' Fair this year, by the Rix Compressed Air Machinery Company, of many compressed air devices, among which will be these tools in operation, so that the public may see for themselves how useful and economical they are.

THE WALKER COMPANY IN CALIFORNIA.

The genuineness of the competition of the Walker Company will be appreciated in the announcement that it will in the near future establish a Western factory for the assembling and erection of its Pacific Coast products and for general repair shops. This factory will be consolidated with the new establishment of the Abner Doble Co., which is soon to be erected on the corner of First and Main streets, San Francisco. From the design of the building it is evident that the factory will be by far the most modern of any on the Pacific Coast.

THOMSON ARC CIRCUIT AMMETER.

The standard instruments which the General Electric Company has lately placed upon the market includes the Thomson Arc Circuit Ammeter. This is a high grade instrument for switchboard purposes, and is mounted upon black enamelled metal base, with the cover, binding posts and screws of bright nickel. It



measures over all 8 inches by 8 inches.

The qualities claimed for this instrument, which should recommend it to those connected with the arc lighting plants, are its high degree of accuracy, its perfect and permanent reliability for service, together with an absolute dead-beat movement of the pointer. The scale is long and may be clearly read from a distance. One ammeter may be used for either half or full arc circuit, the divisions being wide and the calibration marked for both services. Permanency of calibration is obtained by the elimination from the instrument of any parts liable to change. Each ammeter is provided with a self-contained and conspicuous Polarity Indicator, consisting of two signals—the white showing under normal conditions, the red on reversal, the latter remaining in sight until the current has once more passed through the instrument in the proper direction. The ammeter may be used for front or back connections, connection posts and studs being furnished as conditions require. Several of these instruments were shown at the Electrical Exposition in New York during the Convention of the Electric Light Association and elicited much favorable comment.

INFORMATION WANTED.

Mr. W. F. Forsey, secretary and manager of the Co-Operative Packers' Association of Fresno, Cal., writes: "Will you kindly put the writer in communication, or obtain for him the necessary information in regard to the cost of a reduction plant for extracting aluminum from aluminum clay, and also the estimated or actual cost per ton of producing aluminum."

"MORE THAN CREDITABLE."

The following self-explanatory letter reflects the sentiment of many readers who find the Journal to be specially active in chronicling the condition and advances in the state of the applications of electricity on the Pacific Coast. It is produced verbatim:

OAKLAND, Cal., June 12th, 1896.

Geo. P. Low, Esq., Editor Journal of Electricity, San Francisco, Cal.

Dear Sir:—I read with more than ordinary interest your publication of the long distance transmission installed for the San Joaquin Electric Company at Fresno, and cannot forbear complimenting you upon the meritorious publication both from an electrical and mechanical standpoint.

Your illustrations are all that could be desired while the letter press is more than usually intelligent.

I hope that on the Pacific Coast you will meet with the reward which your service to the cause of electrical distribution merits. Your paper, in my judgment, ranks as high as any journal of like character in the East, and the particularly adaptable field in long distance transmisson has given you an opportunity for the edification of your readers in presentng a more than creditable article not only on the Fresno plant but also on the Folsom transmission.

Wishing you every success, I am,

Yours very truly,

JOHN A. BRITTON.

The Replogle Governor Works, of Akron, Ohio, by Mr. W. C. Parsons, Secretary, also writes: "We have received a copy of your Fresno Edition published in April, and were much interested in th handsomely illustrated article on the plant of the San Joaquin Electric Company. We have seen dscriptions of this plant in other papers largely copied from your article, but none of them coming anywhere near equal to the elegance of your pubication."

ELECTRO-MAGNETIC "BILKS."

The much-debated question of the physiological effect of magnetism has been authoritatively set at rest. Experiments were conducted at the Edison laboratory to determine the effect produced on persons subjected to a magnetic field of great power. The conclusion reached was that the human organism is in no way appreciably affected by the most powerful magnet known to modern science, either as regards circulation, ciliary or protoplasmic movements, or sensory or motor nerves. It was further shown that the ordinary magnets used in medicine have a purely suggestive effect, and would be equally serviceable if made of wood. This is equivalent to saying that a large proportion of the so-called "magnetic" appliances bought usually without medical advice, for the cure of various ailments, have no healing or curative power whatever, and their influence is purely imaginary.

THE "PASSING" OF MUNICIPAL OWNERSHIP.

Speaking of the fire at Yuma, the Tucson Star says: "There is something passing strange in connection with the destruction of the electric plant."

It is still more passing strange how it can be replaced by another equally good for $350, while the one that burned cost the Territory less than a year ago $3,000. It is passing strange where that $2,650 surplus was placed.—Phoenix (Ariz.) Republican.

WHAT IS ELECTRICITY?

A philosophysing subscriber suggests that Mr. Chauncey M. Depew's famous telegram sent from the National Electrical Exhibition Building to Tokyo and back should have read. "God is, Nature treasures, Science utilizes, Electricity," or in other words, Electricity is the Infinite Power. Nature stores it and Science utilizes it.

The Lay Press.

POPULAR REFLECTIONS OF THE CONDITIONS AND PROSPECTS OF ELECTRICAL ENGINEERING ON THF PACIFIC COAST.

The success of the San Joaquin Electric Company's great venture is now assured and the practical demonstration of the capability of the power developed by the gigantic generators in the distant hills is hailed with delight by the people of Fresno who now have at their command motive power of unequaled strength and cheapness.—Fresno (Cal.) Expositor.

The more trolley lines Santa Ana can secure the better. If one to Orange is followed by another to Anaheim it will be a good thing, and Santa Ana will feel the benefit. The trolley roads, and frequent train service between this town and Pasadena, has helped both Los Angeles and its neighbor, and Santa Monica is showing the benefit the new road has been to it, already. The excellent local service given by the Southern Pacific, Southern California and Terminal roads has helped Los Angeles, as well as the surrounding towns, and Santa Ana will find her experience similar to that of Los Angeles if she follows the example of her big sister.—Los Angeles Express.

Judge D. R. Prince, United States Commissioner at Fresno, is enthusiastic over the outlook for better times at Fresno. "Improvement is in the air," he said yesterday. "Our crops are not as large as they have been in years past, but prices will be better. We are somewhat given to grinning when our friends of Sacramento go into hysterics over their Folsom electric power. It is an insignificant affair compared with our plant at the headwaters of the San Joaquin. After the Niagara Falls plant ours is the finest in the United States, and that means the world. It has a capacity of 80,000 horse power, of which only a fraction is now utilized. The J street and Blackstone avenue line of street cars, principally owned by Charles L. Walter, will be converted into an electric line at once, and will then be extended into the thickly populated section north and east of the city for a distance of from twelve to fifteen miles. Electric light and power is served all over the town. —San Francisco Examiner.

Many important factors are at work in this city and county to make the outlook for the future more than hopeful. Conversations with many business men convince us that there is to be a remarkable growth and development in the near future that will add greatly to the importance of Santa Rosa. There is a reason to believe that more manufacturing industries are to be started soon: that railroad and immigration projects are to add to the city's commercial importance and that there is to be a general expansion of those industries that add to the wealth and prosperity of communities. The development of electrical energy by means of water power will do much to forward the city's growth. It is believed that very soon certain water falls located within seven miles of Santa Rosa will be utilized for the development of electric power. The existence of a high fall in this neighborhood is known to a few, and in the opinion of an expert is sufficient to warrant the projection of an electrical transmission scheme that will do much to foster and encourage manufacturing projects to our town. —Santa Rosa (Cal.) Democrat.

Los Angeles has had a little experience lately that shows the necessity of greater safeguards around bids for franchises. A man who really wanted to build a railroad—ex-Mayor Workman—got the council to advertise the franchise for sale. Nobody else was in sight; nobody else wanted to build it, so far as the public knew, and nobody else was expected to bid on it. But to the surprise of all a dark horse turned up and overbid Mr. Workman, thereby becoming technically entitled to the franchise. The successful bidders did not want to build a road, and had evidently bid only to keep anyone else from building, or to speculate on the franchise by selling it. So, after a perplexed deliberation, the council have concluded that it was not a fair thing and have declared all bids off. The moral is that nobody should be allowed to bid on a franchise unless he give adequate security to do the work in case the privilege is awarded him. The matter of the few hundred dollars bid is a trifle, and is no guaranty of good faith. The security should be away up in the thousands, which nobody could afford to trifle with. Then we should have no more straw bidders.—Pasadena (Cal.) Star.

On the Arizona canal there is a fall of water sixteen feet and if utilized would furnish 1,000 horse power. There are no dams to build, no tail race to cut, a cheap shed or house for shade, and put in place turbine water wheels, attach dynamos, generate a thousand horse power of electricity, sink wells along the Grand, Maricopa and Phoenix canals where water may be had in from 12 to 20 feet, use the Centrifugal pump, and pump the water into the canals, the water will again sink to be pumped up again. There will be a little loss in operation is all. A pump that will require 20 horse power to drive should throw 500 inches of water from a well 20 feet deep. The cost of machinery, enough to fill the three ditches ought not to be $20,000. One man can run the power and one the pump, so here is the expense—two men and say 50 cents a day for oil. The water wheels and pumps will be built of steel, simple and durable. Why this plan has not been carried out is a mystery. Will some of the kickers tell us through the Herald why this plan will not work and is not best?—Phoenix (Ariz.) Herald.

"Gas for lighting purposes is more than holding its own against electricity now," said D. J. Collins of Philadelphia, at the Grand last night. Mr. Collins is the representative of the United Gas Improvement Company, which has plants in thirty-eight American cities. It is one of the largest syndicates in the world. Until about two years ago electricity was making big inroads into the business of the gas companies. It was giving a better light for a comparatively fair price, judged by what had to be paid for a less brilliant illumination by gas. Things have switched around considerably in eighteen months. I do not think that more than 30 per cent of the electric light companies in the country are now paying dividends. Improved gas burners have greatly increased the illuminating power of gas and cheapened the cost to the consumer. Three feet of gas an hour will now do what eight or nine feet did not do so well formerly. Furthermore, these three feet of gas are made to give a 60-candle power light. Ordinary electric lights are 16-candle power and the price per hour is far in excess of the cost of three feet of gas. Gas companies as investments are, therefore, safe against dangerous encroachments from electricity even if the decreased consumption of gas may show some falling off in receipts."—San Francisco Examiner.

The subject of "rapid transit" is engaging, but it fatigues. Like the poor, it is "always with us," and always will be. The hopeful gentleman who believes it a problem capable of solution, and, looking down the dim vistas of the time to be, sees an adequate number of uncrowded cars pleasantly traversing the town on the surface of the earth, in the air above the earth and through the tunnels under the earth, may justly boast a gift of prophecy that is independent of fact and superior to reason. There can never be sufficient "accommodation" for all who wish to travel, for with every increase in the accommodation there is a more than corresponding increase in the number of those wishing to travel; the supply begets the demands, which outruns it. Nothing is more certain than that the discomforts of overcrowding keep out of the cars enough persons to overcrowd them at every lessening of the discomforts by an increase in the number of cars and frequency of trips. To the many thousands of persons who go every Sunday

of the summer to suburban resorts better facilities for reaching these places would add other thousands, until our latter state would be no better than our former. A limited number of persons travel for business; an indefinite but greatly larger number travel for pleasure; and behind these are a virtually inexhaustible multitude who would travel for fun if it were fun to travel. With the accommodations and facilities for which we seraphim and cherubim continually do cry, and at "popular" rates (the rate most truly popular is the least rate), nobody would walk a block—the entire population would rise as one man and board the cars. These be truths to the perpending whereof we might profitably set such ailing understandings as the gods have gifted us withal.—Ambrose Bierce in San Francisco Examiner.

Not long ago one of the principal mining companies in the Bodie district, was casting about to see how they could make the mines pay dividends. Fuel for steam purposes had become so expensive that a mine of low grade ore could no longer be made to pay. It was suggested that steam should be abandoned for electricity. But there was no water power within eight or ten miles of the mine. One of the small streams was finally taken up, which had a head of several hundred feet. An electrical plant was put in which drives all the works at the mine. The difference is that a non-paying mine has become once more a dividend paying concern. This is not a single instance of the transition from one system to another. But it will serve very well as an illustration. A new era of mining in California has just begun. Wherever electricity can be used as power, it will be employed. It settles the question of fuel at once. A mountain stream ten or fifteen miles distant, is not too remote, provided a sufficient head of water can be obtained. The power created can be converted into electricity and transmitted to the mine with the best results.

The great mother lode in Calaveras and Amador counties, which has turned out so many millions, has been worked thus far by the use of steam. This lode is believed to extend hundreds of miles. The news comes that Engineer Hammond, of South African fame, is now on his way to California as the representative of foreign capitalists, who bought and bonded a large number of claims on this mother lode, and are about to work them by the employment of electricity generated by water power. Men who have exploited the South African mines find themselves drawn to the mines of California. They will employ the processes which have made mining a successful industry elsewhere. A mining company starting with two millions and having another million in reserve, with a famous American mining engineer to lead off, is probably the beginning of the new mining development in California.—Oakland (Cal.) Tribune.

Personal

R. S. Masson has been promoted to the District Engineership of the Pacific Coast office of the Westinghouse Electric and Manufacturing Company, with headquarters at the Mills Building, San Francisco.

Professor A. Van der Naillen has returned to San Francisco after a three months' tour of the principal scientific centers of Europe where he has been engaged in purchasing apparatus and gathering ideas for the betterment of the Van der Naillen School of Engineering.

Mr. Charles S. Knight, manager of the Fort Wayne Electric Corporation, and who was a recent visitor to San Francisco, has returned to Fort Wayne, via Portland, Or. He will probably be on the coast again by the latter part of August.

Mr. Edgar E. Clark, of the Engineering Staff of the Stanley Electric Manufacturing Company, and who has been on the Coast for the past year mainly for the purpose of supervising the transmission plant of the Nevada County Electric Power Company, will shortly leave for Bonita, Mont., to erect for the Golden Scepter Mining Company a 360 k.w. Stanley generator and transmission plant.

At the recent commencement exercises of the graduating classes of '96 from the Stevens Institute of Technology, Hoboken, N. J., the degree of Doctor of Engineering was conferred upon Commodore George W. Melville, Engineer-in-Chief of the United States Navy, in appreciation of the excellent engineering work performed by Commodore Melville for his country and the advancement of the science of steam engineering, well illustrated in the world-wide famed "White Squadron." Only once before, in the twenty-five years' history of the Stevens Institute has the degree of Doctor of Engineering been conferred, and then upon Professor R. H. Thurston, of Rhode Island, who formerly occupied the Chair of Mechanical Engineering in Stevens Institute, and is now director of Sibley College, Cornell University.

Mr. John M. Klein has resumed the sole ownership of John M. Klein's Electrical Works, Mr. Marion L. Mowry having resigned from the partnership heretofore existing.

Mr. J. R. McKee, manager, and Mr. F. O. Blackwell, chief engineer of the Power and Mining Department of the General Electric Company, of New York, have returned to Schenectady after a hurried inspection of the General Electric transmission plants at Fresno, Sacramento and Portland.

Mr. J. P. Williams, of the Chloride Battery Company, was in San Francisco recently. Among other matters Mr. Williams is understood to have given considerable attention to the matter of a Pacific Coast agency for the Chloride Company, and it is probable that the agency will be placed with Mr. Irving M. Scott, of the Union Iron Works.

Mr. C. P. Gilbert, at present Managing Director of the Edison Illuminating Company, of Detroit, has submitted his resignation, to take effect August 1st, after which date he will assume the managing directorship of the Sacramento Electric, Gas and Railway Company, which recently succeeded to the property and interests of the Folsom Water Power Company, the Sacramento Electric, Power and Light Company, and the Central Electric Railway Company, of Sacramento.

Obituary

Mr. John M. Gamewell, inventor of the original box of the fire alarm system which bears his name died of heart disease in Hackensack, N. J., on July 19th. Mr. Gamewell was born in Marleborough, N. C., and attained the age of 74 years.

Reports of the Month.

INCORPORATION

Los Angeles, Cal.—The Tejunga Water and Power Company. Object: To own and operate water, power and electric works. Capital stock, $5,000,000. Directors, J. W. Craig, L. R. Garrett, S. Merrill, R. W. C. Wilson and M. L. Wicks.

San Francisco, Cal.—The L. Kollman Company. Capital stock, $100,000, of which $60,000 has been subscribed. Objects: To manufacture mechanical and electrical devices. Directors, A. Iverson, M. Greenblatt, Robert Capelli, Joseph C. Meyerstein, Joseph E. Bien and Peter De Tamble.

Fresno, Cal.—The Stockton and San Francisco Electric Power Company. Objects: To develop power in the Sierra Nevadas and transmit it to San Francisco. Capital stock, $5,000,000, of which $2,475,000 has been subscribed by L. E. Walker, Sig. Wormser, F. Younger, Charles G. Bonner and J. C. Shepard.

Marysville, Cal.—At the meeting of the stockholders of the Marysville and Nevada Power and Water Company, held in Smartsville, they organized by the election of the following officers: President, John Spaulding, of Placer county, General Manager of the South Yuba Canal Company; First Vice-President,

D. P. Donohoe, Marysville; Second Vice-President, R. C. Walrath, Nevada City; Secretary, Louis Conrath, Smartsville; Treasurer, J. K. O'Brien, Marysville; Attorneys, W. H. Carlin, Marysville, and G. L. Hughes of Nevada City; Directors, John Spauding, R. C. Walrath, G. L. Hughes, W. F. Engelbright, D. P. Donahoe, J. K. O'Brien and Louis Conrath. W. L. Waggoner will be engineer, and W. F. Engelbright consulting engineer. The company has acquired the water rights of the Yuba river at the Narrows. Capital stock, $2,000,000, of which $1,040,000 is subscribed.

Great Falls, Mont.—The Great Falls Electric Light Company. Capital stock $30,000, all subscribed and assessable. The first board of directors are John F. Cowan, Charles N. Atkinson and Robert Vaughn.

COMMUNICATION.

Arcata, Cal.—A telegraph line will probably be constructed from the terminus of the Vance railroad in Humboldt county to Trinidad.

Visalia, Cal.—On August 12th the Common Council will sell a franchise for a telephone and telegraph system in and upon the streets and alleys of the city of Visalia.

LITIGATION.

Sacramento, Cal.—A jury in the case of Claire vs. Sacramento Electric, Power and Light Company has rendered a verdict of $2,000 and costs for damages alleged to have been received by the plaintiff from an electric railway guy wire. The verdict of the jury was based on the belief that the plaintiff was rendered partially deaf by reason of his ear touching the guy wire.

Portland, Or.—Judge Shattuck, of the Superior Court, has rendered Mrs. Christina Olsen findings for $1,050 in her suit for $2,500 damages against the Portland General Electric Company for injuries received from contact with a guy wire.

Oakland, Cal.—J. W. Siemson has sued the Oakand, San Leandro and Haywards Electric Railway for $5,000 damages for injuries alleged to have been received from the overturning of a car.

San Francisco, Cal.—The Supreme Court has affirmed the decision of the Lower Court in the suit of James A. Weymire et al. vs. the San Francisco and San Mateo Railway Company et al. The San Mateo road issued to the Trust Company, in May, 1891, 1,100 bonds at $1,000 each, giving a trust deed to its plant and franchises. Three years later the Trust Company sued the mortgagors in compliance with the terms of the trust to foreclose it and have a receiver appointed. Pending this action Weymire and other stockholders in the railway sued to enjoin the Trust Company from prosecuting its action on the ground that the bonds had been fraudulently issued without consideration, and all transfers of these bonds to the defendants were asked to be declared void. The lower court ruled against Weymire, and from this ruling an appeal was taken to the Supreme Court, resulting as stated.

Alameda, Cal.—The case of Fleming vs. the City of Alameda has been practically settled by Judge Frick, of the Superior Court, who has verbally dissolved the preliminary injunction granted Fleming, and will file a written opinion later. The Court expressed the opinion that the City Trustees were justified in incurring expenditures for power at the City Electric Light Works.

Los Angeles, Cal.—The warfare being waged between the Los Angeles Lighting Company and the Gas Consumers' Protective Association has reached the courts in a suit brought by the latter against the former for $25,000 damages, alleged to have been sustained by removal of certain gas governors from the Los Angeles county court-house, and other buildings situate within the city of Los Angeles. The complaint recites that on or about June 15, 1896, the defendant unlawfully entered upon the premises of the above parties and removed from and disconnected with said premises all of the gas-saving apparatus of the plaintiff company. An injunction is asked restraining the Los Angeles Lighting Company from interfering with any of complainants' gas appliances and for damages as stated. Mrs. R. M. Dale, a lodging-house keeper, has also brought suit for $2,000 against the Lighting Company for damages alleged to have been suffered by reason of the defendants removing a gas governor and refusing to allow its replacement. The Lighting Company does not object to the use of gas regulators, and only seeks to compel the Consumers' Association to place its apparatus on the gas pipes in a workmanlike manner without physical injury to its pipes and meters. It appears evident that no trouble would have occurred over regulators had not the Lighting Company's property been seriously damaged by bungling workmen.

Tacoma, Wash.—The city of Tacoma has petitioned the Court against the Tacoma Light and Water Company and the Tacoma Gas and Electric Light Company to set aside and declare fraudulent and void the deed of transfer of the gas plant and all the real estate and other property of the Tacoma Land Company, which was sold or supposed to have been sold to the Tacoma Gas and Electric Company. The complaint was prepared by Attorney Wickersham, as special counsel for the city under the recent ordinance passed by the council, and not only asks to have the transfer set aside, but asks that the gas plant, all of blocks 2200 and 2201, the Puyallup water works and all the shares owned by the Tacoma Light and Water Company in the Commercial Electric Light Company and other valuable properties, be placed in the hands of a receiver and applied to the payment of the city's judgment for $787,500.

In the matter of the City of Tacoma vs. the Commercial Electric Light and Power Company, Judge Stallcup has ordered the temporary injunction continued in force until the case is finally decided, and fixed the indemnity bond to be given by the city at $6,000. The city, claiming that the defendant was without right to string wires on the city poles and without right to string them on poles of its own in the streets and alleys of the city, commenced this action to perpetually enjoin the doing of the same, and obtained the temporary restraining order now on in the case.

TRANSMISSION.

Sandon, B. C.—The Sandon Water Works and Light Company, by J. M. Harris, Manager, has published notice that it will apply to Lieutenant Governor for sanction to take and divert 100 inches of water from Tributary Creek, at a point about half a mile or less from the junction of said creek with Carpenter Creek.

Marysville, Cal.—Supervisor Conrath has acquired land which gives him the water right to the power of the Yuba river at Deer Creek Narrows, a short distance east of Smartsville. This water has been turned over to the Marysville and Nevada Power and Water Company, which proposes to build a 100-foot stone dam in the narrows for impounding water for a transmission plant via Brown's Valley, Smartsville and Bonanza Ranch.

San Francisco, Cal.—The Abner Doble Company, agents of the Walker Company, are erecting for the Pacific Power Company, a 300 kw. 500-volt Walker multi-polar generator direct coupled to a Williams triple expansion central valve vertical engine running at 300 revoutions per minute.——Prince Poniatowski has returned from London, accompanied by Edmund Davis and Percy Tarbutt, who have become interested in the California Exploration Company. The company has secured the services of John Hays Hammond as engineer, and has about perfected arrangements for the installation of a transmission plant taking power from the Amador ditch, the Sparanza ditch, and another ditch five miles long between the Mokolumne river and the Tripp water right; 4700 horse power is said to be available.

Sonora, Cal.—Paul Jarboe and J. J. Grooks of San Francisco have purchased a controlling interest in the Tuolumne Electric Light and Power Company, the price paid being reported at $125,000. The new controllers of the company will at once take steps to enlarge the plant, and have already contracted with the Rawhide, App and other mines in the vicinity to furnish them with power. Many more mines have signified their intention of replacing steam and water power by electricity.

Lightning struck the plant of the Tuolumne Electric Light and Power Company at Columbia on July 17th, burning out the equipment and shutting down power for the Rawhide mine, as well as the lights in Sonora and Columbia.

Salt Lake City, Utah.—The plant of the Big Cottonwood Power Company was placed in operation on June 4th, which marked the inauguration of one of the most important electric power installations in the country. The station is located in the Big Cottonwood Canyon, where 3400 cubic feet of water per minute is available at the lowest stage delivering a minimum of 2450 horse power. The water is conveyed through about 2,000 feet of 48-inch plate steel pipe line, steel varying from one-quarter to three-quarters of an inch in thickness to four 60-inch Pelton wheels which run under a head of 370 feet and deliver 650 horse power each at 300 revolutions. These wheels are direct connected to four General Electric three-phase generators and special Pelton wheels are provided for the exciters. The transmission is at 10,000 volts. The power thus generated is transmitted to Salt Lake City and used for running an extensive street railroad system, as also for lighting the city and for general power purposes. An additional water supply is available, which it is proposed to utilize later, increasing the capacity of the station to 5,000 horse power. The works have involved an outlay of something over $500,000, all of which has been furnished by Salt Lake capitalists. Contracts for power have already been made—amounting to more than $100,000 per year, with a very considerable surplus of power yet to be disposed of. It is expected that the investment upon the present basis, will pay not less than 20 per cent per annum over and above all operating expenses.

Murphys, Cal.—I. H. Linn and George Batten have received a county franchise for the generation of transmission of electric energy from a plant situated on the Stanislaus river at or near the junction of the Middle Fork and the North Fork of the said river. A water right of 5,800 inches has been secured and the head available is 1,208 feet to develop which it will be necessary to build a ditch about thirteen miles long, which will cost $77,000.

Phoenix, Ariz.—The Mesa Consolidated Canal Company, which owns some of the largest irrigating ditches in the Salt River Valley, has constructed a canal and power house in the original Mesa Canal, and has installed a 500 horse power turbine, from which will be operated a General Electric three-phase generator. The power thus generated will probably be utilized in the towns of Tempe and Mesa. Dr. A. J. Chandler is president.

Fresno, Cal.—The San Joaquin Electric Company is receiving the hearty support of local industries and in addition to the power contracts it now holds, principal among which is for the delivery of 150 kw. of power for the Sperry Flour Mills and 60 kw. for the Fresno Water Company, it has placed electric power in a number of local industries in barley mills, laundries, vineyards, and will also operate the new raisin seeding plant.

San Diego, Cal.—J. D. Schuyler, C. E., has presented a report to the municipal ownership club on the various water sheds and reservoir sites in the county available for a municipal water works. The report suggests the feasibility of deriving 1,100 horse power from the water supply.

Redding Cal.—It is stated that W. C. Brunsn of San Francisco is manager for an Eastern syndicate that proposes the installation of an electric plant operated by water power from the Pitt river. The scheme contemplates the erection of an electric smelter for reducing the ores of the iron mines on the McCloud river and the building of a railroad from the mines to the smelter. It is stated that the preliminary work is under way and that about 1,500 men will be employed in the execution of the plan.

Minersville, Trinity county, Cal.—The Minersville Hydraulic Gravel Mining Company, is contemplating the erection of an electric transmission plant operated by water power next spring.

Redlands, Cal.—The Redlands Electric Light and Power Company is figuring on the installation of a 350 horse power steam equipment to be used as an emergency plant.

Juneau, Alaska.—George L. Grant has been appointed general manager of the Alaska Electric Light and Power Company. The company is enlarging the capacity of the plant to 3,000 16-c.p. lamps.

Sacramento, Cal.—The Westinghouse transmission plant being installed by the Central California Electric Company and running from Newcastle to Sacramento, a distance of thirty miles, consists two 400 kw., 400 volta two-phase generators, delivering current through suitable station switch board to step up transformers which deliver three-phase current to the line at a potential of 15,000 volts. The lines are carried on Fred M. Locke's triple petticoat china insulator supported by 40-foot cedar poles. The Sacramento distribution will be of the two-phase system.

Spokane, Wash.—Mr. A. F. Burleigh, of Methow, who recently bonded the Monitor mine, together with other capitalists of Seattle, contemplate building an electric supply plant to furnish power and light to work the mines in this district and also to build reduction works to treat the ores.

Butte, Mont.—L. L. Nunn and others of Colorado have made several trips to Madison county, where they have been looking up water powers for the generation and transmission of electricity for various purposes.

Bridgeport, Cal.—The Chronicle-Union states that surveys of the river below town are being made and assumes therefrom that the long talked of electric transmission plans for working the Bodie mines is about to materialize.

Sacramento, Cal.—A 50 h.p. 500-volt Tesla motor now runs the State printing office.

MISCELLANEOUS.

City of Mexico, Mex.—Prominent gentlemen of Birmingham, Alabama, are contemplating the establishment on a large scale of works for the manufacture of mining and electrical machinery. The plant is expected to cost about $100,000 and will be established in the city of Aguascalientes.

Fresno, Cal.—Ordinance 326 has been adopted fixing the compensation to be paid by house movers and others for cutting aerial electric wires, as follows: For each electric light of No. 6 gauge and over, cut, raised or lowered, $1.50; electric power wires of No. 6 gauge and over, $2.50 each, and not exceeding $2 for each wire less than No. 6 gauge; telegraph or telephone wires, one wire only, not to exceed $1; two to six wires not exceeding $5; seven to twenty wires not exceeding $10; over twenty wires not exceeding $20; for telegraph or telephone cables which cannot be lowered or cut, the actual cost of raising the same.

San Francisco, Cal.—The following records were made by the members of San Francisco Union No. 6, of the National Brotherhood of Electrical Workers during the contests at the second annual picnic: The gold medal for the championship of the Pacific coast was awarded to J. A. Cameron, who climbed a 45-foot pole in 16 seconds; second prize, J. J. Cameron, 16 3-5 seconds; third prize, George Frost, 16 4-5 seconds. Cross-arm contest—First prize, A. Wagner, 2:27; second prize, F. Christ, 3:03 2-5; third prize, G. Frost, 4:58 3-5. Hand-line throwing contest—First prize, won by W. Bentley, rope on ground 3 feet; second prize, Jack Cameron, 2 feet 10 inches. Country climbing contest—First prize, J. J. Cameron, 0:30 1-5; second prize, J. A. Cameron, 0:33 2-5; third prize, George Frost, 0:34 3-5.

Salt Lake City, Utah.—The hot air bath of the sanitarium is now heated by incandescent electric lamps.

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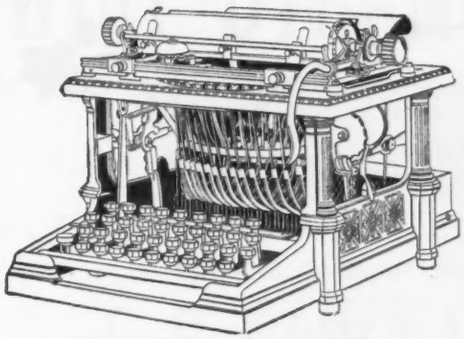

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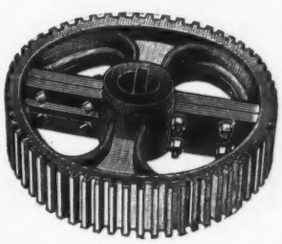

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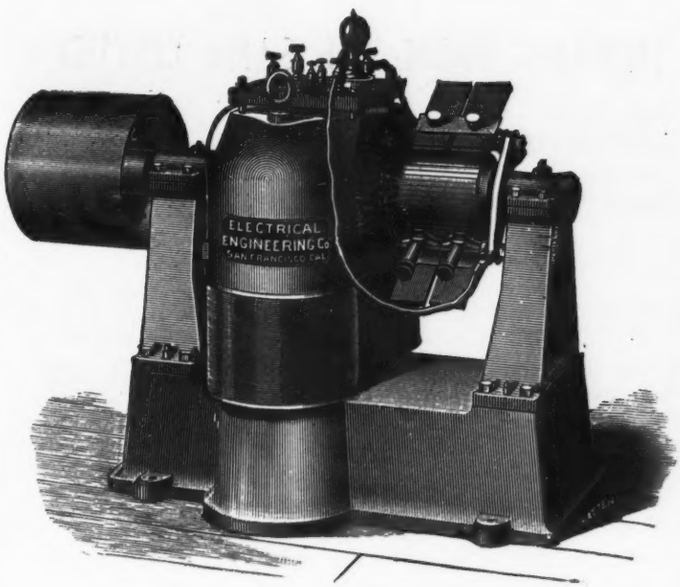

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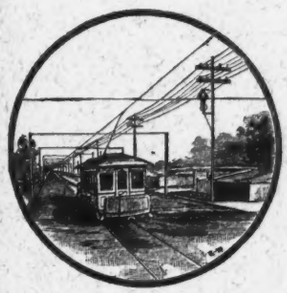

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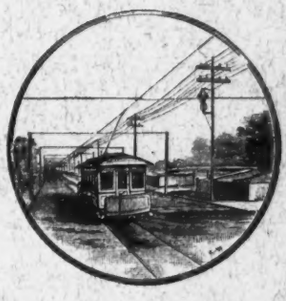

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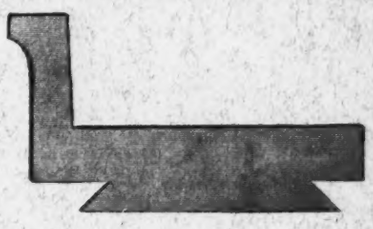

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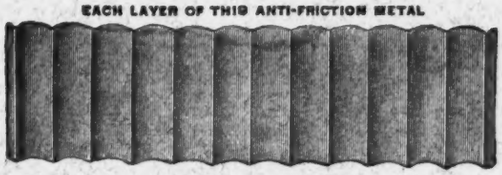

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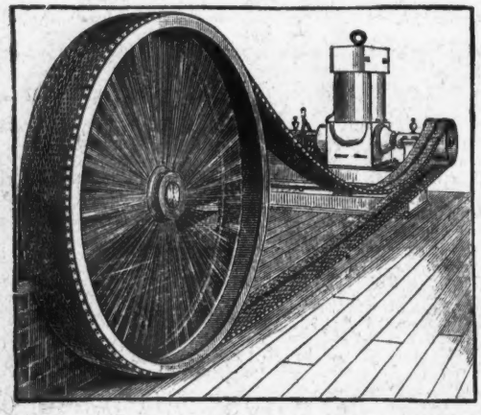

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